HUNTERS HOT SPRINGS

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HUNTERS HOT SPRINGS
GEOTHERMAL
ENVIRONMENTAL ANALYSIS RECORD

This report outlines the environmental effects of the proposed geothermal lease in the vicinity of Hunters Hot Springs, Montana. The lands involved in this Environmental Analysis Record lie within a five-mile radius of the hot springs. The proposed action area was selected for study because of geothermal lease application M-28771, requesting to lease four tracts of natural resource lands totalling approximately 760 acres.

The Secretary of the Interior is charged with the implementation of the Geothermal Steam Act of 1970 which provides for the development of federally owned geothermal resources. This Environmental Analysis Record documents the analysis of the anticipated impacts upon the environment due to the proposed action. It is presented to determine if an Environmental Impact Statement is needed according to Department of Interior policy and to meet the requirements of the National Environmental Protection Act of 1969.

Comments on the proposed action and draft Environmental Analysis Record were solicited from individuals and private groups, as well as local, state, and other federal agencies. Their comments are greatly appreciated and used throughout development of the final Environmental Analysis Record.

Farrell K. Burns

Acting District Manager

January 21, 1976

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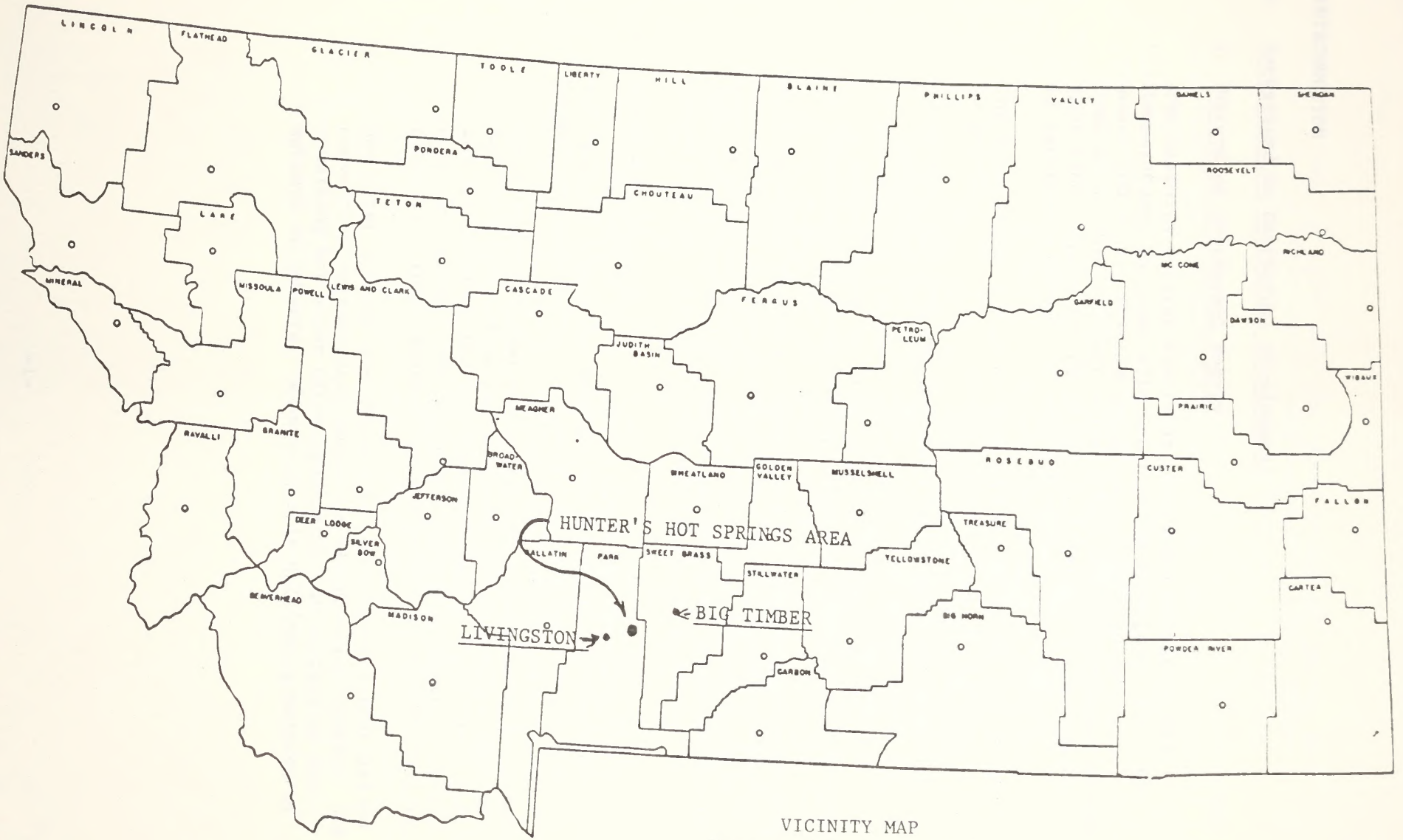

VICINITY MAP
Hunters Hot Springs Area

Figure 1

I. INTRODUCTION

A. Background on Geothermal Development

1. Nature of Geothermal Energy

The earth is a large reservoir of thermal energy (heat). Temperatures increase with depth at an average of $1^{o}F.$, for every 100 feet. This is called the geothermal gradient. In some areas this gradient exceeds 10 to 1,000 times the average heat flow. These are the areas of interest for development of geothermal energy.

The heat source for these near-surface hot spots are thought to be either:

A deep seated magma (molten rock) from which the heat escapes via faults or --

A shallow magma or magma chamber in areas of fairly recent volcanic activity (within the last few million years).

Groundwater is heated by these energy sources and raises toward the surface. In some places the hot water is trapped by overlying impermeable rocks. In others it reaches the surface through faults. Hot springs, fumaroles, mud pots, and geysers are the surface expression in such cases.

2. Geothermal Systems

Two types of geothermal systems are considered to have present commercial application:

Vapor-dominated systems (dry steam) are believed to contain both saturated steam and water in the reservoir. When a well is drilled, the decrease in pressure super-heats and dries the steam. The steam may be used to drive a turbine directly. These systems are thought to be relatively rare.

Hot water systems are thought to result from a heat driven convection system which moves the heated water upward. The upwelling hot water often penetrates the surface as hot springs or geysers. When a well is drilled, a portion of

the water flashes to steam and both steam and water come to the surface. The steam is used to drive a turbine and the hot water is discharged at the surface or reinjected into the ground.

Two other types of systems exist which are not capable of sustaining a geothermal development with present day technology. They are basically a hot dry rock system composed of impermeable rocks overlying a local heat source and a geopressured reservoir system consisting of highly porous sands saturated with hot brines under high pressure. Both systems present difficult technical and economical problems and development is still in the research stage.

3. Operational U. S. Geothermal Energy

The Geysers, in northern California, is the only commercially developed geothermal energy field in the United States, with the exception of local use for space heating in a number of places.

At the Geysers, five power generating plants operate on a vapor dominated geothermal system to produce 400 megawatts of electrical power. This is roughly equivalent of 2/3 the electrical power demand of the City of San Francisco. The ultimate capacity of the field, when fully developed, is estimated to be between 1,000 and 3,000 megawatts--sufficient power to satisfy the demands of the entire San Francisco Bay urban area.

The initial development at the Geysers was pioneered by Magma Power Company. Union Oil Company is the current operator.

Exploration has been going on for the last 15 years or so in many localities in the western states. Technical development problems and the economics of alternate fuel sources have thus far delayed commercial power development.

4. Prospective Montana Geothermal Energy

Forty (40) major hot springs have been identified in Montana and certainly many more small ones exist. Other areas, such as Marysville near Helena have been identified where the geothermal gradient is exceptionally high and yet no surface manifestation is present. These have been identified primarily by thermal

measurements in old mineral exploration drill holes. Other methods are now being used for exploration and will be discussed in a later section.

The Geological Survey is currently identifying Known Geothermal Resource Areas (KGRA) in Montana. These are areas of known geothermal potential and will be offered as a competitive lease sale.

The only active drilling program in the State has been at the Marysville Geothermal Area. Here a deep exploration hole was drilled to 6,790 feet. This was a joint effort sponsored by the National Science Foundation and was strictly a research type of investigation.

Other activities in Montana include mostly water sampling, seismic surveys, land acquisition, and miscellaneous geological investigations. There has been a marked increase in these activities in the past few years.

The discussion of Geothermal Energy in this report will be directed primarily toward electrical production. However, we may add that other uses for Geothermal Energy include; space heating, buildings and greenhouses as well as industrial ventures requiring a direct heat source. There are numerous other possibilities that may result if the energy is found.

B. The Proposed Action

The applicant's proposed action is the exploration and, as appropriate, development and production of geothermal resources within an approximate 5-mile radius (Figures 1 and 2) of Hunters Hot Springs in Park County, Montana. The extent of development will depend upon the results of exploration. This analysis arbitrarily assumes that the action will include three power plants each dominating an unspecified section with about 30 wells and associated pipelines, disposal ponds, roads, transmission lines, etc. It is further assumed (again arbitrarily) that development will begin in 1980, be complete in 1990, and that the geothermal resource will be depleted and the operation closed out by 2040.

BLM's proposed action is the granting of a noncompetitive lease on 440 acres of National Resource Land in two tracts near Hunters Hot

Springs as filed on by W. C. Kaufman on April 5, 1974[1/]. Although the federal land, being in the minority, is probably not essential to geothermal development in this area, it is legitimately sought by the applicant to avoid having to bid for it competitively in the event exploration is successful.

Federal actions that will be necessary before development can take place include the development of lease stipulations, issuance of the lease, and BLM-GS joint review of the Permit to Drill. State actions include permitting under the Major Facility Siting Act.

C. Purpose and Scope of the Analysis

The purpose of this analysis is to provide information useful in the decision-making process, the relevant decisions being (1) should an environmental impact statement be written? (2) should the leases be granted? and (3) what environmental stipulations, in addition to those already in force, are appropriate. It is designed to be readable and understandable to the administrative decision-maker and those segments of the public that may be interested in influencing his decisions through political or legal processes.

In order to achieve this purpose, the analysis includes a description of (1) the applicant's proposed action and the necessary federal and state actions or decisions, (2) the objective of and need for the proposed action, (3) the interrelationship of the proposed action with other projects, (4) the environment that would be impacted by the proposed action including the probable future condition of that environment if the project is not implemented, (5) current standard operating procedures that will enhance benefits, reduce the environmental impacts of the project, if implemented, (6) the environmental impacts of the project assuming implementation of the standard operation procedures, (7) impacts possible through human error or system failure, (8) technically possible and reasonably available mitigating measures in addition to those already required, (9) unavoidable impacts, (10) resources that would be permanently unavailable for other uses if the project were implemented, (11) the impact of the project on the long-term productivity of the impacted region and resources, (12) alternative ways of achieving the stated objectives of the proposed action and the probable impact of those alternatives.

1/ The original application included four tracts totalling almost 760 acres. However, two of the tracts (Tracts 3 & 4 in Fig. 2) where the minerals are federal but the surface is privately owned, have been suspended from the lease pending court determination of whether geothermal resources constitute surface waters or leasable minerals.

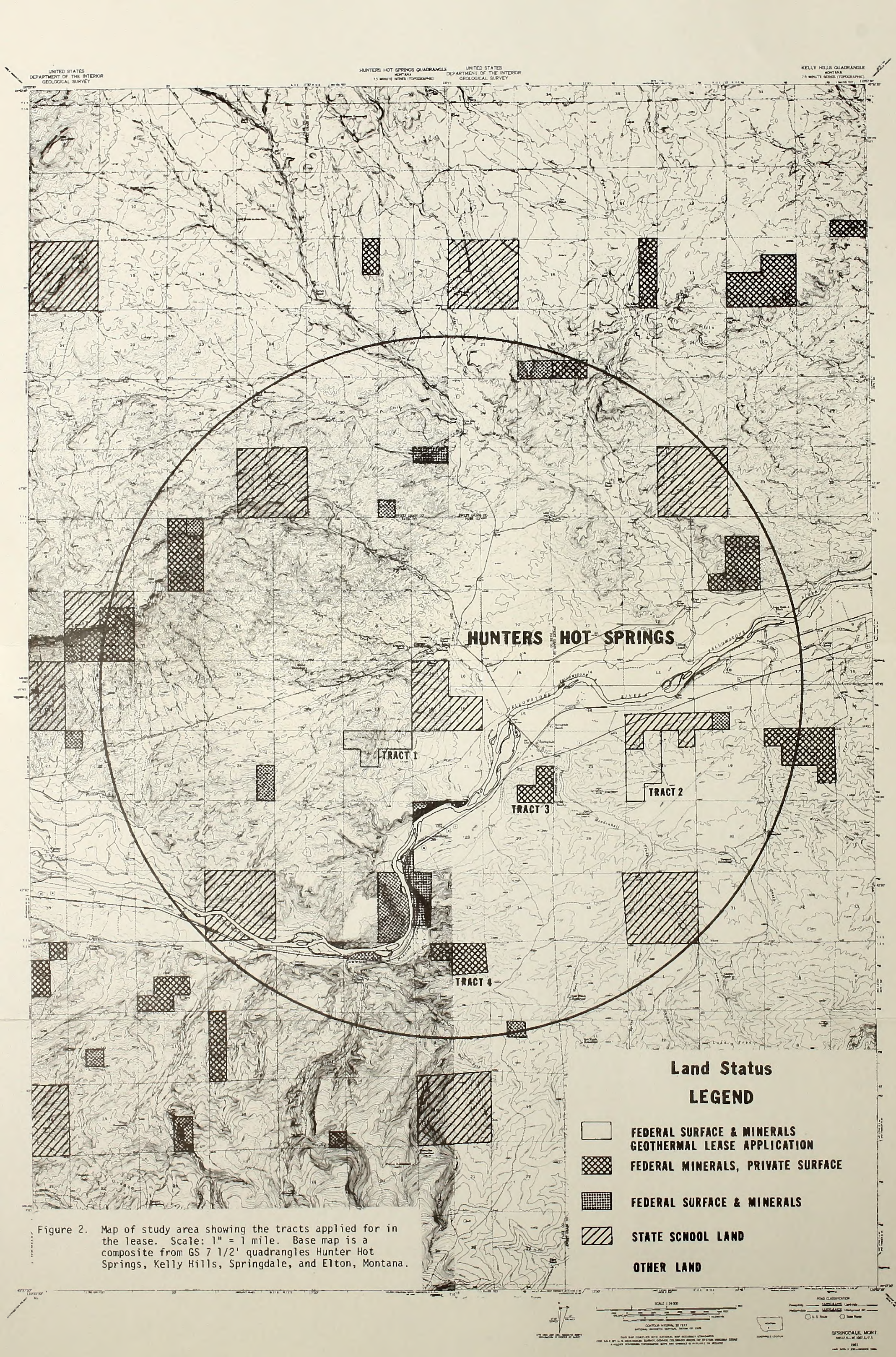

Figure 2. Map of study area showing the tracts applied for in the lease. Scale: 1" = 1 mile. Base map is a composite from GS 7 1/2' quadrangles Hunter Hot Springs, Kelly Hills, Springdale, and Elton, Montana.

The analysis has three aspects, geographically. One is a broad analysis that looks at impacts of the entire hypothetical development on an area conceived as a circle with a 5-mile radius centered on Hunters Hot Springs in Park County, Montana. Another aspect looks at impacts on the four tracts originally applied for in the lease (see Fig. 2), particularly incremental impacts in addition to those that would occur anyway if the lease were denied. The two tracts suspended from the lease are included in the analysis so that the environmental work will not have to be repeated if the court determines them to be available for leasing. The third aspect concerns regional (multi-county) impacts particularly on socio-economic aspects of the human environment. The various regions considered are described in the appropriate sections.

Both short-term and long-term impacts are treated in the analysis. The short-term extends from the beginning of exploration to full development, the long-term from full development through the life of the project on into the future. These time frames are unknown and difficult to estimate. However, for the purposes of this analysis they have been arbitrarily (or hypothetically) set forth in the section above.

II. DESCRIPTION OF THE PROPOSAL

The purpose of this section is to summarize the history and background of events leading up to the proposed action.

A. History and Background

On December 24, 1970, the 91st Congress approved Public Law 91-58--The Geothermal Steam Act of 1970. Subsequent to passage of the Act, the Bureau of Land Management promulgated regulations with which to implement that law.

In accordance with these regulations, application was made to the BLM on April 5, 1974 by Mr. W. C. Kaufman for a non-competitive geothermal lease. The BLM Montana State Office, Branch of Lands and Minerals Operations adjudicated the application and submitted it to the Billings District Office for environmental analysis, appropriate lease stipulations, and lease recommendations.

This Environmental Analysis Record is a result of the above actions.

B. BLM and Other Federal and State Actions Involved

When geothermal resources occur on federal lands, their development is subject to federal control. Required federal actions include resource planning, environmental assessment, development of lease stipulations, issuance of lease, operational control, monitoring to insure compliance, etc. These federal actions are controlled or concurred in by the Bureau of Land Management (the leasing agency), Geological Survey, and the surface management agency. In this case, BLM is both the leasing agency and the surface management agency. At different stages in development, action responsibility and concurrence in actions may lie with one or more of these agencies. To formulate these federal actions, coordination with other federal and state agencies is required by the National Environmental Policy Act and related guidelines. The advice of private environmental organizations is also often sought and utilized.

In addition to federal actions, certain definite procedures which regulate geothermal development are required by state law. Probably the most significant for Montana is the Major Facility Siting Act which requires issuance of a permit prior to geothermal development. Cooperative state-federal agreements aimed at avoiding duplication of effort, particularly in the area of environmental assessment, are in force.

C. Applicant's Proposed Action

1. Project Objective and Need

The ultimate objective of the project is the economically successful production of electricity and perhaps other by-products of geothermal energy. Although an analysis of the demand for the possible resultant power has not been made, it is assumed that any power produced will provide a welcome boost toward the goal of energy independence. Even if the additional energy is not needed, it is likely to provide an environmentally favorable substitute for fossil fuel derived power.

2. Location

The area under consideration in this analysis is conceived as a circle with a 5-mile radius centered at the community of

Hunters Hot Springs in Park County in south central Montana about two miles north of the Yellowstone River and 1.5 miles from the Sweetgrass County line. (Figures 1 & 2). Although it is not known where or even if development will take place, the analysis arbitrarily assumes that three geothermal power plants of about 100 MW each will be developed dominating three unspecified sections with the plants and associated wells, pipe, transmission lines, etc. As can be seen in Figure 2, the two areas currently involved in the lease application are very small (totalling 440 acres) compared to the area of possible development. Both the surface and minerals of these two sites are federal. Their legal description is:

T. 1 S., R. 12 E., P.M.M.
Sec. 20: N½N½, SE¼NW¼
Sec. 24: NE¼NW¼, S½NW¼, N½SW¼, SW¼SW¼

Note that Section 20 is in Park County while Section 24 is in Sweetgrass County.

Two additional tracts (both in Park County) amounting to some 320 acres where the surface is private and the mineral federal, were originally in the lease application. However, these tracts have been suspended from the application pending court determination of whether geothermal resources constitute surface waters or leasable minerals. The legal description of these two tracts is:

T. 1 S., R. 12 E., P.M.M.
Sec. 22: S½SE¼, NE¼SE¼

T. 2 S., R. 12 E., P.M.M.
Sec. 4: Lots 1, 2, and 3, S½NE¼

These tracts are specifically included in the analysis so that the environmental work will not have to be repeated if the court determines them available for leasing.

3. Time Frame

The time frame for development is difficult (perhaps impossible) to predict. Unknowns upon which the time frame is dependent

include the results of exploration and economic feasibility and related decisions of the developers.

For the purpose of this analysis, despite the above uncertainties, it has been assumed that exploration will take place between 1975 and 1980, that development will begin in 1980 and be complete in 1990, and that the geothermal resource will be depleted and the operation closed out by 2040.

4. Stages of Implementation

Basically, four separate stages of implementation have been identified in geothermal development.

Exploration (including test drilling)
Development
Operation
Close-Out

The progression from one step is dependent upon the success of earlier stages. Actually, one stage often blends into another and it would be common for exploration and development to be undertaken in one area of a geothermal field while production was going on in another area.

a. Exploration

Exploration includes all activities from the decision to explore for a geothermal area through the actual drilling of one or more exploratory wells.

All exploration activities are covered by a competitive or a non-competitive lease. Any surface disturbing activities up to and including the drilling of shallow temperature gradient holes can be conducted under an approved "Notice of Intent to Conduct Geothermal Resource Exploration Operations" (Form 3200-9) before any lease has been issued. See Appendix III.

Exploration, as related to surface damage, may be classified into four discrete operations, three of which require physical

occupation of the surface involved. They are:

Airborne exploration
Off-road vehicular travel
Road and trail construction
Drilling

Actually, a number of these activities may be going on simultaneously. A large area is covered first, gradually reducing the size until a target drilling site is located.

The applicant's plan of diligent operations as submitted to the BLM in consulting Geologist John Fanshawe's letter of November 18, 1974, envisages the following:

Detailed surface geology, using a kelsh plotter, backed up by ground checks.

Aerial magnetic survey

Passive seismic survey

Selective test wells at less than 200 feet, to measure temperatures and determine shallow heat flow and regional gradients.

Electrical resistivity survey

Other special procedures helpful to this particular problem.

(1) Airborne Exploration

Airborne methods seek to gain an understanding of the subsurface geology. They include:

(a) Aerial photography--for geologic interpretation

(b) Imagery--infrared and microwave for heat and soil moisture differentials.

(c) Magnetic--variations in earth's magnetic intensity.

Airborne exploration produces no surface disturbance.

(2) Off-Road Vehicular Travel

Many exploration activities require off-road travel although existing roads are used where possible.

Cross-country travel is required in the following:

(a) Geological mapping where one or more small vehicles are used.

(b) Geophysical exploration ranging from one small truck to 5-7 trucks may be utilized. Often surface mineral matter and vegetation must be removed from small areas for shot points or receiving sites.

(c) Geochemical surveys including water sampling and soil or rock sampling on a grid system is often used. Small trucks are usually used to transport crews.

(3) Road and Trail Construction

For exploration activities utilizing large equipment in rough terrain, it is often necessary to construct roads. Since they are generally for limited use, they are constructed to low standards.

(4) Drilling

Several types of drilling may be utilized during the exploration stage.

(a) Seismic test holes and temperature gradient holes are drilled with small truck-mounted rigs. The holes are generally between 4 and 6 inches in diameter. An area about 30 x 30 is disturbed by use of the drill rig and the servicing water tank.

(b) Holes drilled for geological interpretations may extend to 1,000 feet, requiring larger equipment. Often a mud pit is needed and it typically may be 30 - 50 feet long, 10 - 20 feet wide, and 3 - 6 feet

deep, depending on the terrain. A total surface area 100 x 100 feet may be disturbed.

(c) Exploration wells may be drilled to a total depth of 5,000 to 10,000 feet and are the same wells as those used for development and production. If successful, they are often converted to production.

A drill pad is leveled and cleared of vegetation. This could include a surface area from less than one acre up to two acres. A reserve pit ranging from 1,000 to 10,000 square feet and 6 - 8 feet deep may be dug to contain waste fluids and drill cuttings.

The well is cemented and cased and a blow-out preventer is installed to control sudden surges of pressure.

b. Development

Development includes all activities from the decision to develop a producing field until commercial power generation and transmission is reached. These operations are conducted only under a geothermal lease (either competitive or non-competitive).

Five discrete operations, as they relate to surface disturbance, are recognized:

Road development
Drill site development
Geothermal pipelines
Plant construction
Transmission lines

Many of these operations would normally be taking place concurrently.

(1) Road Development

During development, roads to drill sites, power plant sites, and along transmission line routes may be

constructed. Roads to producing wells and power plants will be permanent and may be surfaced and stabilized. Temporary roads to drill sites and for construction of power lines will generally be built to a low standard.

(2) Drill Site Development

Wells drilled during the development stage will be similar to exploration wells. Often, somewhat larger equipment is used. The drill pad is leveled and cleared of vegetation. Generally from less than one up to two acres are disturbed. A reserve pit (sump) 1,000 to 10,000 square feet and 6 - 8 feet deep is sometimes dug to contain waste fluids during the drilling operations.

(a) Water - up to 50,000 gallons of water per day may be used in drilling a well. Water may come from shallow wells drilled in the immediate area or from surface water.

(b) Spacing - more than one well is needed to service a geothermal plant. Due to heat loss, wells generally are placed within one-half mile of the plant. Generally, 16 to 20 wells are used per power plant.

(c) Production Testing - each new well is vented to the atmosphere for a period of time to determine flow characteristics and to clean out the hole. Steam, water, and noise accompany production testing. The water is generally caught in the reserve pit and contained while the steam is released to the air.

(3) Geothermal Pipelines

Pipelines 10 to 30 inches in diameter are used to transmit steam or hot water from the production wells to the power plants. The pipes are typically insulated with fiberglass or asbestos to minimize heat loss. Expansion loops or joints are placed at frequent intervals either vertically or horizontally to provide for the extreme expansion and contraction of the pipes upon production startup (heating up) and shutdown (cooling down).

Under present technology, pipelines are constructed above ground to provide for expansion and contraction and to enhance maintenance and detection of leaks. Underground installation is thus far uneconomical and may also present some safety hazards.

The lines form a radiating pattern on the surface, connecting wells with the power plant. They may be painted to blend with the surroundings.

(4) Plant Construction

Generating plants are centrally located to minimize the length of the steam or water pipes from the servicing wells. The largest plants in current use consist of two 45 MW generators housed together so that production is 110 MW per power plant. Power plant spacing is about one plant per 640 acres throughout the productive area.

At the Geysers, in California, the average 110 MW plant building is about 100 x 200 feet and three stories high. The adjacent cooling towers are about a third larger than the generating plant building. The entire generating plant-cooling tower complex occupies an area of about five acres.

(5) Transmission Lines

Power generated from the plant is transmitted via conventional power lines to the area of use. The size and location of the lines is dependent upon the power output and destination.

The lines will tend to be large, considering that 1 MW of plant capacity will service the power needs of about 1,000 people. To express this another way, one 110 MW power plant could supply the power needs of the City of Billings.

c. Operation

The operation phase starts upon reaching commercial power production. Exploration and development are typically carried

on in other parts of the geothermal field simultaneously with the operational activities. The operation stage may be divided into the following discrete operations:

New drill sites
Maintenance
Waste disposal
Production

(1) New Drill Sites

Geothermal fields are long lived resources. The Geysers is estimated to have a minimum productive life of 30 more years. Nonetheless, production slowly diminishes the heat flow and additional wells must be drilled and completed to keep the generating plant operating at full capacity.

Additional wells may also be required to replace wells that have become inoperative and, if the waste waters are disposed of by injection, injection wells may be drilled.

The technique and effect of these wells would be the same as for development wells. On a major producing field, it can be expected that one or two drilling rigs would be operating continuously throughout the life of the field drilling additional or replacement wells.

(2) Maintenance

Repair, maintenance and monitoring of an operating field will require the periodic use of access roads to service the equipment. Existing wells will require occasional repair work or cleanout. The amount of this remedial work will depend upon the production characteristics of the field; severe scaling and corrosion would require frequent remedial work. Normally, one medium-sized drill rig would be required full-time for each 20 - 30 wells (one 110 MW power plant).

(3) Waste Disposal

The work force (both construction and maintenance) for geothermal power plants will usually be housed in the nearest town rather than creating a new town at the site. Thus, waste materials connected with human habitation will typically be handled in the local community.

At the plant site itself, sanitary facilities for workers are provided. Solid wastes are either disposed of in a dump developed at the site or trucked to the nearest established dump site.

The most significant waste disposal problem relates to handling the excess geothermal fluid. Disposal techniques vary, depending on the quality and quantities involved. Any or a combination of the following techniques may be employed:

(a) Evaporation ponds - where water quality is satisfactory, such ponds may provide new aquatic habitat. Where water quality is toxic, special measures may be required to protect the ground water supply, livestock and wildlife.

(b) Natural drainage systems - high quality water disposed of in this manner provides additional resources for agriculture, wildlife and other uses. Low quality water may require extensive treatment before it is suitable for release into natural drainages.

(c) By-product development - in some instances it may be economical to extract useful minerals or gases from the geothermal fluids. This could result in increasing the waste water quality so as to make it available for other purposes. Desalinization may also be feasible in some areas, providing by-product fresh water for other uses.

(d) Reinjection - at the Geysers, excess water is reinjected into nonproductive zones of the geothermal field. Successful reinjection is dependent on the quality of the waste water and the geologic characteristics of the geothermal field. Typical considerations would include: whether plugging and scaling problems will prevent the reservoir from

accepting the fluid; whether fresh water aquifers can be adequately protected from contamination by hot saline waste water; and whether the subsurface rock structure will adequately hold the reinjected fluids.

(4) Production

Production from a geothermal field generally requires 2 - 5 people per plant to inspect, adjust and service the wells, making the rounds about once each day on the existing road network.

Sustained production may have several effects:

(a) Temperature drop - The field will gradually realize diminishing temperatures as the energy is utilized.

(b) Water utilization - Cooling towers will consume about 40 - 45 acre feet of water per year for each megawatt of plant capacity. The water may come from surface waters, steam condensate, waste geothermal water, or from any other water source. This water consumption might be reduced by use of some technique other than conventional cooling towers. One such scheme, called the "night stream cooling system" would theoretically use only 42% as much water.

(c) Subsidence - As large volumes of water are pumped from a geothermal reservoir, some subsidence of the ground surface could have a significant impact. Continuous monitoring might be necessary to detect whether subsidence was occurring. In some instances, reinjection of the waste water might correct subsidence problems.

(d) Seismic activity - Geothermal areas typically associated with seismic activity. Such activity is generally of small magnitude (usually less than 4.5 on the Richter Scale). Fluid pressure changes from both production and reinjection may tend to increase earthquake frequency, though the

relationship is not well known. To date, such earthquakes have been small and there is some evidence to suggest that this minor seismic activity tends to relieve regional stresses and diminishes the likelihood of large earthquakes. Earthquakes sometimes modify geyser activity and may affect other geothermal features such as hot springs.

d. Close-Out

Close-out or final abandonment takes place when energy production ceases to be economic. To date, no developed geothermal field has reached this stage. In a sense, geothermal reservoirs may be somewhat renewable resources in that after a long period of rest, the fluids may become reheated to temperatures that are again usable.

Two discrete operations are expected to take place during close-out:

Removal of improvements

Restoration of surface

(1) Removal of Improvements

The removal of improvements from a geothermal field involves:

(a) Surface improvements - Removal of all structures constructed during field development and operations will be accomplished. Solid waste remaining may either be disposed of in a dump developed at a site or trucked to the nearest established dump.

(b) Wells - The bottom of the hole is plugged with cement and the surface casing is also plugged with about 20 feet of cement. The casing is cut off below the surface and a steel plate welded over the hole. A vertical steel pipe and marker is welded to the plate. The concrete lined excavation surrounding the hole (called the "cellar") is pushed in and the location may be graded and revegetated. The marker remains above ground to provide identification.

(c) Transmission lines - Any of the electrical transmission lines no longer in use will be removed.

(2) Restoration of the Surface

Surface restoration will typically be a gradual process, taking place throughout the life of the field and culminating with the final abandonment. Access roads can be ripped up, landscaped and revegetated. Well and plant locations can similarly be treated but, because of their larger size, complete landscaping to approximate the original surface in steep terrain will not be feasible except in unusual circumstances.

5. Standard Operating Procedures for Environmental Enhancement or Impact Reduction

Safeguards to mitigate environmental impacts expected through lease of federal geothermal resources were initiated by the Geothermal Steam Act of 1970, and amplified by federal regulations developed therefrom. Title 43 CFR 3200 (BLM) and Title 30 CFR 270 (GS) provide the general terms and conditions binding on the lessee. The Geothermal Resource Operating (GRO) Orders were published in the Federal Register for Geothermal Steam and BLM's lease Form 3200-21 detail these safeguards and thus promote understanding and compliance by the lessee. GRO Order No. 4 details required compliance as to 1-Aesthetics, 2-Land Use and Reclamation, 3-Public Access, 4-Recreation, 5-Slope Stability and Erosion Control, 6-Biota, 7-Cultural Resources Preservation, 8-Subsidence and Seismicity, 9-Pollution, Waste Disposal and Fire Protection, 10-Water Quality, and 11-Noise Abatement. GRO Orders Nos. 1 - 3 provide detailed operational guidelines from exploration through production. Compliance to GRO Orders is a condition of any lease issued. See copies of all of above in Appendix III.

Environmental assessment does not cease with issuance of a lease, but continues through the "Stages of Implementation". The lessee is put on notice that as knowledge evolves from his operations, additional mitigation may be required to meet emerging impacts that could not be realistically anticipated during the previous environmental assessment. Sec. 2a, S.O. 2948, which outlines BLM-GS responsibilities for environmental protection under the Mineral Leasing Laws, provides for review of surface use, environmental protection and reclamation aspects of the leasing operations. This provides, in essence, a continuing environmental assessment of a Federal geothermal resources lease.

The above noted federal regulations provide for adherence to state as well as federal standards of pollution abatement, sanitation and waste disposal.

6. Summation of Relevant Data

To develop a simulated model for Montana geothermal development, it is helpful to analyze the Geyser's geothermal area in California.

The Geyser's geothermal field is a vapor dominated (dry steam) system. Dry steam produced through wells is used to drive turbines and produce electricity.

At the Geyser's, approximately 15 wells are required to provide steam for a 110 MW power plant. It was found that well spacing on less than a 20-acre grid resulted in less steam production per well due to the tapping of the same reservoir. This spacing allows an adequate number of wells within ½ mile of each power plant. One-half mile is the probable maximum distance for steam transport due to heat and pressure losses.

At the Geysers, a typical 110 MW plant requires approximately 2,000,000 lbs. of steam per hour. Temperatures and pressures at the turbine are approximately 350^{o}F and 100 psi, respectively. At 100 psi, water flashes to steam at 327^{o}F.

The wells associated with the Geysers produce from 50,000 lbs. to 300,000 lbs. of steam per hour. Therefore, the average well will produce approximately 7½ MW. This indicates that 20,000 lbs. of steam per hour are required to produce 1 MW of power.

No vapor dominated systems are known to exist in Montana. There are good indications of hot water geothermal systems in several areas in Montana. The Hunters Hot Springs area is one of these. In contrast to a vapor dominated system, only about 15 to 20% of the fluid produced in a hot water system will flash to steam when reservoir pressures are relieved by drilling into them. Based on steam production from wells in the Geysers in California and also from wells in Cerro Prieto, Mexico, it is estimated that a potential of about 60,000 - 70,000 lbs. of steam per hour (or 3 to 4 MW per well) could be expected in a hot water system in Montana. Temperatures up to 580^{o}F and pressures ranging from 50 to 150 psi have been reported in other areas

where a hot water system occurs. Results of a geothermometry analysis of hot water at Hunters Hot Springs (GS, 1975) indicate that minimum temperatures of around 179°F might be expected at depth. Surface temperatures of the Hot Springs are about 140°F.

With the hot water system, it seems reasonable to use ½ mile as a maximum distance for steam transportation. Therefore, a 110 MW power plant in Montana, considering a hot water system, 20-acre well spacing, and piping steam up to ½ mile, would require about 30 wells.

This indicates that nearly 640 acres would probably be required for a 110 MW geothermal plant in Montana. Actual surface disturbance probably would not exceed 20 - 25% of the area (see Tables 1 and 2).

In order to identify the impacts associated with each operation of geothermal development, it is necessary to consider the number of surface acres disturbed. The following two tables indicate the approximate number of features that will be found on the ground and the number of surface acres that may be disturbed with each.

TABLE 1

Surface Disturbance Expected From Exploration Drilling Per Lease Area (2,560 Acres)

Feature	No. of Acres Disturbed	No. of Features	Acres Distrubed
Well	2	5	10
Disposal Pond	4	5	20
Access Roads	1.5	5	8
			38 Acres

The activities required to develop one 110 MW power plant are listed in the following table. The number of wells includes those used for production, standby, and reinjection.

TABLE 2

Surface Disturbance Expected From Development of One 110 MW Power Plant Complex (Montana)

Feature	No. of Acres Disturbed/Feature	No. of Features	Acres Disturbed
Power Plant	5	1	5
Well	2	± 32	64
Disposal Pond	4	10	40
Pipeline	1.2	-	30
Roads	13	-	35
Transmission Line	4.5	-	4.5
			178.5 Acres

There would also be geothermal fluids produced at each well during exploration testing and production operations. The fluid production rate from a geothermal reservoir would not be known until the production testing phase is completed. Data from other areas of geothermal development is hot water systems show that fluid rates vary from 440,000 - 900,000 gallons per day per well. At an average of 670,000 gallons per day per well, 30 producing wells would yield approximately 20 million gallons of fluid per day. This is significantly higher than fluid produced in a vapor dominated system such as the Geysers area. The exact nature of such geothermal fluids in Montana is unknown. It can be speculated that they may contain mineral by-products such as sodium, potassium, lithium, cesium, chloride, bicarbonate, sulfate, borate, and silicia. In addition, such toxic substances as boron, arsenic, fluoride, zinc, etc., could be present in the fluids. Because of these components, it would be unlikely that the geothermal fluids would be allowed to escape to the surface or shallow subsurface areas. In addition, the possibility exists that certain noxious and/or toxic gases and vapors such as hydrogen sulfide, ammonia, mercury vapor, carbon monoxide, etc., could be introduced to the atmosphere from the steam component of the resource.

In some cases, these geothermal fluids may be relatively pure water or are capable of being purified. Reinjection wells would probably be used to dispose of unusable geothermal wastes.

III. DESCRIPTION OF THE ENVIRONMENT

A. Existing Environment

The lands applied for in the lease consist of two separate blocks--Tract 1 and Tract 2. The suspended blocks (Tracts 3 & 4 in Figure 2), will also be considered as discussed above. Because the lands in this area are essentially the same in regards to many aspects of the existing environment, the following discussion refers to all four tracts as well as the surrounding area except where otherwise noted.

1. Climate

The climate is typical of eastern Montana with hot, dry summers and cold, wet winters. Temperatures can range from less than $-20^{o}F$ in the winter to over $100^{o}F$ in the summer.

This area receives very much wind, with gusts often reaching over 100 mph. Prevailing winds are from the west. Annual precipitation ranges from 14 to 18 inches per year. This includes an average of 56 inches of snowfall per year.

The following information is from the U. S. Weather Bureau Station in Big Timber.

TABLE 3

Average Annual and Monthly Precipitation and Snowfall in Inches at Big Timber, Montana

	Total Precipitation	Snowfall
January	.64	9.4
February	.68	5.8
March	1.00	9.6
April	1.22	5.4
May	2.69	1.7
June	1.97	.1
July	1.38	0.0
August	1.12	Trace
September	1.35	.9
October	1.41	6.6
November	.75	10.1
December	.53	6.5
Annual Average	14.74	56.1

TABLE 4

Average Temperatures, °F. at Big Timber, Montana

	°F.
Mean Maximum:	
January	35.8
July	86.4
Annual	59.8
Mean Minimum:	
January	14.9
July	52.4
Annual	32.8
Highest:	
January	68.0
July	106.0
Annual	107.0
Lowest:	
January	- 36.0
July	33.0
Annual	- 44.0

2. Air Quality

Air quality over the entire area is very good, due to the remoteness of the area and the lack of human activity. The only particulate matter may be occasional dust during the dryer parts of the summer caused by high winds. This is not a major problem.

3. Topography

The lands involved consist mainly of broad plateau and low, rolling hills which gradually descend to the Yellowstone River Valley floor. In places, these lands have been incised by minor tributaries to the Yellowstone River, forming rather shallow but steep-walled canyons. Elevations range from 4,300' along the valley floor to over 5,000' near the top of the ridges. None of the tracts involved are on the valley floor.

Tract 2 and the suspended tracts tend to be more plateau-like than Tract 1. Also, Tract 2 and the suspended tracts have a north and northwestern aspect, whereas Tract 1 has a south and southeast aspect. This is due, of course, to the drainage pattern of the area.

4. Soils

The Soil Conservation Service Area Offices for both Park and Sweetgrass Counties have not completed soil inventory maps for their respective counties. However, enough soils data is available to make the following interpretations. Data was obtained from several SCS sponsored conservation projects on different ranches in the area.

There are essentially two categories of soils on the lands involved in the lease application:

----The steeper slopes (8% to 30%) are covered by shallow soil with a loamy surface and a clayey loam subsoil underlain by bedrock. Soil depths range from 10" to 20", depending somewhat on the percent of slope. These soils have been classed as non-agricultural and have a moderately high erosion potential.

----The soils on the broad plateaus range from sandy loams to clayey loams. Depth to bedrock may reach to over 48" in areas

where the surface is essentially flat. These areas are classified as productive for agricultural purposes and some are presently in grain production. Erosion potential is slight due to the moderate slope (-8%).

Both these soil categories are controlled by land form and are similar except in depth to bedrock. Surface exposures of bedrock can be found in both zones.

5. Geology

The area included in this report is in the southwestern edge of the Crazy Mountains basin. This basin is elongated northwest and is approximately 40 to 75 miles wide and 100 to 130 miles long. The Crazy Mountains basin is bordered by the Beartooth Range to the west, the Big Belt and Little Belt Mountains to the north, and the Lake Basin and Pryor Uplift to the east. The basin is of late Cretaceous and Paleocene age.

The Crazy Mountains to the north are composed of Tertiary age intrusive igneous rocks. The Beartooth Mountains to the south are composed of an uplifted block of pre-Cambrian metamorphic rocks and Tertiary igneous intrusives.

The rock exposed in the vicinity of Hunters Hot Springs belongs to the Livingston formation and Fort Union formation (Figure 3). It is by far the greatest portion of bedrock in northern Park County. This formation has a thickness of at least 14,000 feet (McMannis, 1957), and consists of andesitic sediments which were deposited in late Cretaceous and early Tertiary time. The thickness in the Hunters Hot Springs area, however, is significantly less.

McMannis has divided the Livingston Formation into 5 parts:

(1) A lower 4,500 foot unit of dark gray-green medium-to thick-bedded coarse grained andesitic sandstones and conglomerates with minor shaly beds and a few modular horizons. The basal beds are conformable and gradational with the underlying Eagle formation sandstone.

(2) A finer-grained valley-forming unit about 3,500 feet thick consisting of fine-grained andesitic sandstone micaceous shales, and bentonitic clays with some interbedded coarser-grained andesitic sandstone. Colors range from several shades of purple to grey-green and pale greenish-gray.

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TKd

TKl

TKl

TKi

HUNTERS HOT SPRINGS

Qal

TKth

TR.1

TR.2

TR.3

TKl

Qal

Ku

TR.4

TKi

Ku

Geologic Map

Qal
ALLUVIUM

TKth
TULLOCK MEMBER OF THE FORT UNION fm & NELL CREEK fm, UNDIFFERENTIATED

TKl
LIVINGSTON fm

Ku
CRETACEOUS, UNDIFFERENTIATED

TKd
DIKES & SILLS

TKi
INTRUSIVE ROCKS

CALCITE VEINS

Figure 3. Generalized Geologic map of Study Area. Scale 1"=1 mile. From Stoll and Armstrong, USGS Bulletin 1042-M, 1958.

(3) A conglomerate and andesitic sandstone about 3,500 feet thick with coarse andesitic sandstones predominating in the lower 1,500 feet.

(4) An andesitic sandstone about 2,000 feet thick with sporatic conglomerate beds.

(5) An upper conglomerate unit about 1,000 feet thick.

The units as listed are not always easy to distinguish in the field. In fact, the lithologies may differ with different locations. The andesitic rocks of the Livingston formation are equivalent to the Tullock member of the Fort Union formation, Hell Creek formation, Lennep sandstone, Bearpaw shale, Judith River formation, and Claggett shale.

A formation record for a well drilled southwest of Hunters Hot Springs in T. 1 S., R. 11 E., Section 25 shows the following formation tops:

Basla Virgelle	1832'
Telegraph Creek	1996'
Muddy	4583'
Newcastle	5273'
Dakota-Fuson-Lakota	5481'
Morrison	6006'
Swift-Rierdon-Piper	6170'
Tensleep-Amsden	6464'
Tyler	6674'
Madison	6943'
Devonian	8228'
Red River	8786'
Cambrian	8905'

6. Hydrology

a. Surface Water

The Yellowstone River, is the major stream that flows through the blocks of land involved in the lease application. Unnamed and intermittent streams flow from the surrounding foothills to the river. Mean annual discharge of the Yellowstone above Livingston through the past 48 years is about 3,700 cubic feet per second. The Shields River joins the Yellowstone between Livingston and Springdale; hence the mean annual discharge at Springdale is somewhat higher.

b. Ground Water

Ground water is obtained from the alluvium along the Yellowstone River and its tributary streams and from the Livingston formation, which is described in the section on Geology. Ground water data compiled by the Montana Bureau of Mines and Geology for the Hunters Hot Springs area is summarized in the following table.

Shields River Valley Drainage

Ground water in storage, available to wells . . . 6,000 acre-feet

Perennial recharge. . . . . 1,000 acre-feet

Area of aquifer . . . . . 2,000 acres

(above refer to alluvium only)

Well depths	Alluvium	6 to 48 feet
	Livingston fm. . . .	13 to 315 feet
Water table	Alluvium	2 to 20 feet
	Livingston fm. . . .	5 to 275 feet
Well yields	Alluvium	12 to 640 gpm
	Livingston fm. . . .	8 to 10 gpm

Yellowstone River Valley Drainage (Springdale to Livingston

Ground water in storage, available to wells . . . 30,000 acre-feet

Perennial recharge. . . . . 5,000 acre-feet

(above refer to alluvium only)

Area of aquifer . . . . . .10,000 acres

Well depths	Alluvium	8 to 52 feet
	Livingston fm.	30 to 140 feet
Water table	Alluvium	6 to 23 feet
	Livingston fm.	5 to 88 feet
Well yields	Alluvium	19 to 900 gpm
	Livingston fm.	5 to 800 gpm

Potential alluvium yield. . . . . 1,000 gpm

Where permeable, the Livingston formation yields small amounts of water for domestic and stock use. Large yields sufficient for industrial or irrigation use are generally not available from the Livingston formation except from extensively fractured zones. Many small springs or seeps discharge water from the aquifers in the Livingston formation. Large springs are associated with fractures that are partly filled with veins of calcite or with an extensive deep-seated fracture or fault system, as is true of Hunters Hot Springs.

The Eagle sandstone, which underlies the Livingston formation, is about 700 feet thick in the area of investigation. The Eagle has not been explored as a water supply in the area, but it is a reliable aquifer throughout most of central Montana. Deeper aquifers that have not been tested include the Cloverly, Swift, Tensleep, and Madison formations.

c. Hunters Hot Springs

Although Hunters Hot Springs is not within the lands in the lease application, it is the reason for interest in the geothermal resources of the area. Studies by Montana State University show that the thermal waters at Hunters have a maximum temperature of 61°C (140°F) and flow from 9 principal and at least 10 smaller openings. The estimated discharge from the springs aggregates about 1,500 gal/min. The following analysis of water from the springs was made on a sample collected by the U. S. Geological Survey in October 1974.

Chemical Analysis

Hunters Hot Springs

October 1974

	Mg/L		Mg/L
SiO_2	62.2	HCO_3	192
Ca	0.6	SO_4	28
Mg	0.02		18
Na	85.0	F	.88
K	.06	B	.70

CATION TOTAL 383 ANION TOTAL 11%

PH + 9.36

SPRING WATER TEMP (SURFACE) 136.5°F

Two dissolved solids, sodium and silicon oxide are found in the water but the level of toxicity is not known.

The geothermal gradient for the Hunters Hot Springs area is $0.9^{o}C$ per hundred feet (AAPG Geothermal Gradient Maps of the US, Map 21, Montana). The temperature of the discharge has been explained as the result of circulating deep groundwaters being affected by the local geothermal gradient in the Crazy Mountains basin.

7. Plants

Foothill grassland type with scattered scrub timbered ridgetops and brushy coulee bottoms. These areas drain into the Yellowstone River bottomlands with the typical river bottom type vegetation. The area's principal forage species are wheatgrass, fescues and needle-and-thread. The distinguishing features of this subtype (foothill grassland) are the admixture of plains and mountain species and the predominance of wheatgrasses and fescues. The chief wheatgrasses are bluebunch wheatgrass and western wheatgrass. The chief fescues are Idaho fescue and sheep fescue. Another distinguishing feature is the shrub and tree covered canyons that descend into this type.

Other common species in the area are:

Shrubs: douglas hawthorn (Crataegus douglasii)
saskatoon serviceberry (Amelanchier alnifolia)
western chokecherry (Prunus vigriniania)
western snowberry (Symphoricarpos occidentalis)
buffaloberry (Shepherdia canadensis)
rose (rosa sp.)
sagebrush (Artemesia tridentata)
skunkbrush (Rhus trilobata)

Grasses: Idaho fescue (Festuca idahoensis)
Sheep fescue (Fe stuca ovina)
Bluebunch wheatgrass (Agropyron spicatum)
Western wheatgrass (Agropyron smithii)
Needle and thread grass (Stipa comata)
Sandberg bluegrass (Poa secunda)
Prairie junegrass (Kolevia cristata)
Green needlegrass (Stipa viridula)
Blue grama (Bouetloua gracilis)
Cheatgrass (Bromus tectorum)
Brome (Bromus sp.)
Wheatgrasses (Agropyron sp.)
Bluegrasses (Poa sp.)

Forbs: Western yarrow (Achillea millefolium)
Clubmoss (Selaginella sp.)
Lupine (Lupinus sp.)
Phlox (Phlos sp.)
Fringed sagewort (Artemesia frigida)
Broom snakeweed (Gutierezia sarothrae)
Curlycup gumweed (Grindelia squarrosa)
Coneflower (Rudbeckia sp.)

Trees: Juniper (Juniperus scopulorum)
Pine (Pinus ponderosa)
Lumber pine (Pinus flexilis)
Cottonwood (Populus sp.)

Greatest density and diversity of vegetation occurs in the Yellowstone River bottom lands and the heavier soil areas of coulee bottoms. Ridgetops and hilltops where erosion has taken place have reduced plant density and diversity.

8. Animals

A variety of wildlife species seasonally utilize the habitat within the lease areas. The Wildlife Concentration Areas Map (Figure 4) indicated use areas for consumptive wildlife species within the area.

Tract 1 is occasionally used by a few deer and/or antelope; however, this particular section is not intensively used by wildlife.

Tract 2 is a mule deer winter range and antelope also winter on the edges of these lands and on property adjacent to them.

The suspended tract in Sec. 4, T. 2 S., R. 12 E., is an excellent mule deer wildlife range. A local elk herd of approximately 30 - 40 animals may also use this land on occasion. There also may be some yearlong deer use.

The suspended tract in Sec. 22, T. 1 S., R. 12 E., also is a mule deer winter range with the probability of some yearlong use.

Appendix VI is a list of mammals, birds, reptiles, amphibians, and fish that are important to the Study Area and could be

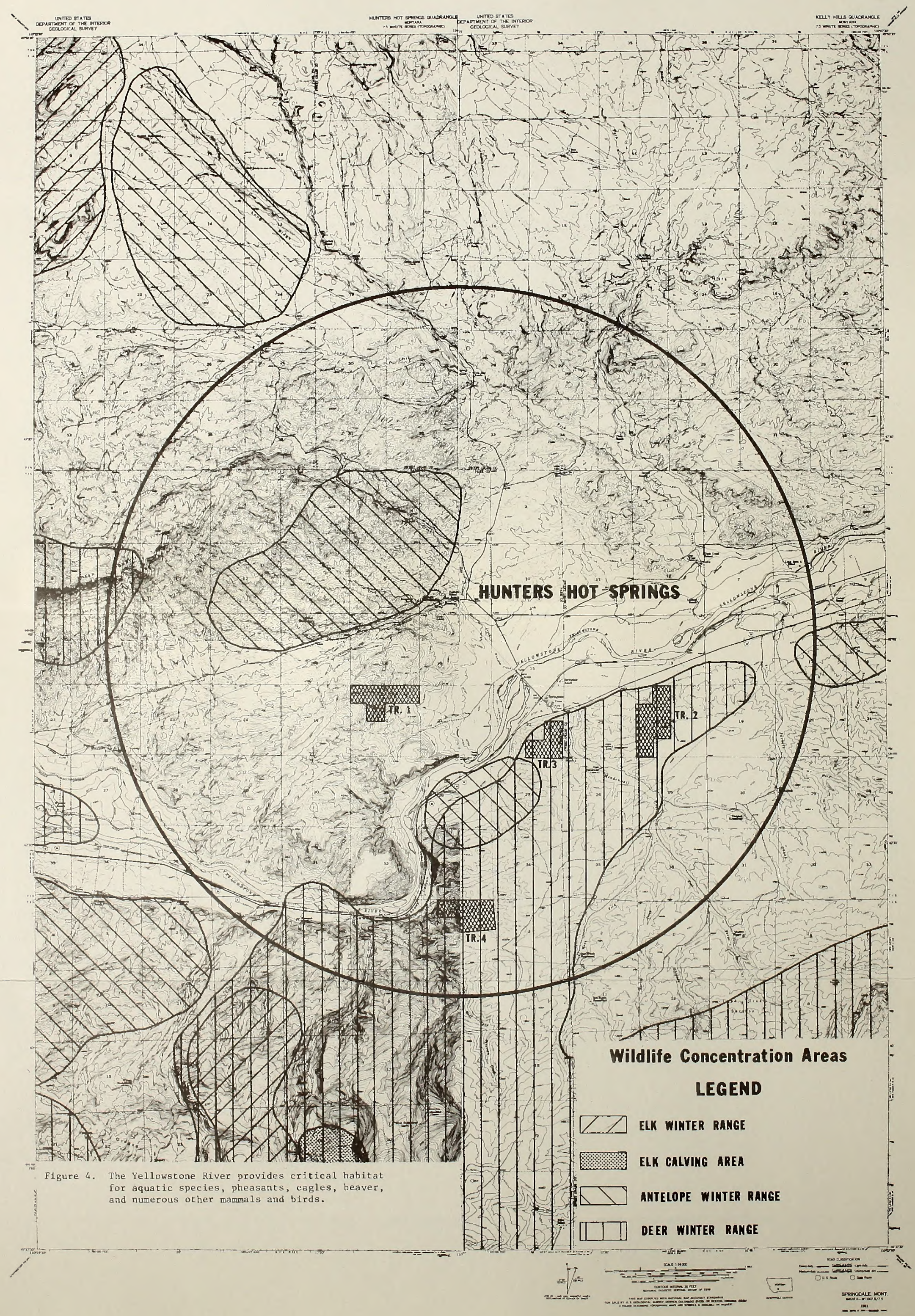

Figure 4. The Yellowstone River provides critical habitat for aquatic species, pheasants, eagles, beaver, and numerous other mammals and birds.

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TR. 1

TR. 2

TR. 3

TR. 4

Visual Use Zones

LEGEND

PRIMARY

SECONDARY

HISTORIC

Figure 5. For explanation see Description of the Environment, Aesthetics and Appendix IV.

SPRINGDALE, MONT.

Figure 6. For explanation see Description of Environment, Aesthetics, and Appendix IV.

impacted by geothermal development. A complete listing is included in Step 3, URA, Yellowstone Planning Unit and is available at the Billings BLM District Office.

No officially endangered or threatened species are known to use the BLM lands subject to geothermal lease. However, bald eagles winter along the Yellowstone River and are often observed in the vicinity of Springdale within the Study Area. Perregrine falcons could possibly use the area. The Yellowstone River through the Study Area is classified as a Blue Ribbon Stream by the State of Montana.

9. Noise

Generally, noise in the area is of the natural type; that is, birds, wind, and river sounds. Occasional noise from highway US 90 can be heard on Tracts 1 and 2 and the suspended tracts, an infrequent vehicle may be heard on the trail across Tract 2.

10. Aesthetics

The visual environment in the vicinity of the proposed action can best be defined in relation to land forms and land uses. Six classes of lands are delineated as having significantly different visual character. All classifications are subjective.

Riverine lands are those along the Yellowstone River being predominantly free from visual intrusion. The presence of flowing water, sand bars, islands, cottonwood and willow dominated deciduous forests and abundance of visible wildlife species especially waterfowl identify this class.

Cliffs are defined as ranging from vertical drops to slopes too steep to traverse easily on foot. They form obvious focal points within the visual environment. Where steepest they usually appear as raw geologic strata; where gentler they appear as tree covered steep hillsides with abundant rock outcrops.

Rough breaks are characterized by moderately to steeply rolling terrain having rocky outcrops, stream valleys and scattered stands of coniferous forest.

Grasslands vary from flat terraces and valleys to rolling hills primarily covered with nature grasslands or pastures. Occasional intermittent stream channels may intersect the grasslands.

Agricultural lands include croplands, hay meadows and other lands where intensive agricultural activities are carried out, and are usually divided by fences into small areas. Agricultural lands are differentiated from grasslands in that human activities are more obvious and that irrigation may prolong the time that the areas are green.

Industrial, Residential, and Transportation lands are those intensively altered for use by man. In the Study Area these lands include the town of Springdale, the vicinity of Hunters Hot Springs, the Highway, Railroad and Powerline Corridors.

Each of these categories were evaluated using criteria outlined in Appendix IV to establish quality of scenery. This evaluation implies that certain of the visual classes are more important in establishing the visual identity of the environment than others.

Figure 5 shows the delineation of visual use zones, and Figure 6 indicates visual character classes.

The scenic quality classes should be interpreted as representing the naturalistic quality of the visual environment, and as such the higher the rating the less tolerant to human disturbance. That is, it should not be strictly interpreted that Class C scenery is less interesting or less pleasing than Class B, for this is a judgment made by the individual. Furthermore, the arrangement or patterns of combinations of visual classes may be more important than the scenic class alone. The ratings do tell us that the Riverine environment can be easily degraded by incompatible human activities, while the agricultural lands, being essentially a product of human endeavor, can withstand more intensive intrusion without degradation of the visual environment.

Accepting the thesis that the importance of a scenic view is at least partially a function of the number of people

viewing it, visual use classes can be established. In this case a simplistic model is used whereby the foreground/ middleground views from the interstate and from Springdale are delineated. It is assumed, therefore, that intrusions within this primary visual zone will degrade the visual environment more than those in the background or not visible zones. Criteria for establishing foreground/middleground was line site to a point where details of the physical environment begin to blend into uniformity.

A historic visual zone is delineated around Hunters Hot Springs. This represents the area in which development might affect this historic setting. It should be noted that many intrusions already exist in the area.

11. Prehistory and History

Hot springs are usually logical sites for historic and/or archaeological resources. Hunters Hot Springs is presently on the state inventory of historic places by virtue of historic events that occurred there. Archaeological significance has not been determined.

a. Prehistory

The Study Area is potentially rich in archaeological resources. A search of the records at the University of Montana, Department of Anthropology reveals no recorded archaeological sites within the immediate vicinity of the lease tracts. However, this is considered a result of lack of study rather than absence of resource.

A number of significant sites have been found within a 30-mile radius of Hunters Hot Springs. Data from these sites indicate that man lived in the area continuously from about 10,000 years ago to the present. The reconstruction of past lifeways and settlement patterns for the upper Yellowstone River basin will come only with increased scientific study. Because Hunters Hot Springs was a favorite camping site in historic times, it seems likely that this was true in prehistoric times. The artifact collections of local residents support this theses. for this reason, the potential for valuable archaeological sites in the Study Area is high. However,

until systematic survey and intensive scientific studies are conducted on the lease tracts, the significance of the resource will remain questionable.

b. History

The written history of the Study Area began in 1806 when Captain William Clark of the Lewis and Clark Expedition camped along the Yellowstone near present-day Springdale and described the surrounding country.

From 1864 to 1868, the Bozeman Trail served as an emigrant route from the Oregon Trail near Bridger's Ferry, Wyoming, to Bozeman and the mining country. It was not important as a freight route since it could not compete with steamboat freight. The army, under pressure from Territorial politicians in Montana and business interests in the midwest, fought a three-year limited war to keep this trail open. Portions of the trail were later important as routes from the Gallatin Valley for settlers moving to the Yellowstone country and to Northern Wyoming.

The spring of 1864 marked the beginning of the Bozeman Trail, when John Bozeman led a group of pioneers into the Montana gold fields via this route. One day behind the Bozeman party was a smaller party, one of whom was Dr. Andrew Jackson Hunter and his family. While camped one day in the vicinity of what is now Hunters Hot Springs, Dr. Hunter discovered the springs while out hunting. Hunter saw many Indians camped around the springs. These people probably believed in the curative properties of the mineral water, as was commonly believed in the 1800's and early 1900's. Dr. Hunter recognized these qualities and staked a claim to the land containing the springs when he reached Bozeman.

Dr. Hunter returned in 1870 and built his home at the springs. Hunter also built a dam between the hot and cold creeks; and in the big pond, people, both red and white, bathed for years. 1873 saw Hunter building more pretentious bath houses. Cost of lumber was $80.00 per 1,000 feet in Bozeman, plus an added $60.00 per 1,000 feet for hauling to the springs. The Crow were friendly to the Hunters and did not resent the encroachment, nor did Hunter try to deprive them of their rights to bathe there.

Here is an account of the springs by Lt. Bradley as stated in his journal:

> ....found the water very hot...sulfur evidently predominates. Gypsum is abundant in this neighborhood. Dr. Hunter's family is now at the springs, but full of dread of the Sioux. His house is, in the summer season, something of a resort for the afflicted, but the Sioux frequently appear in the vicinity and once attacked the house--facts which do not attract custom. The springs pour out a copious stream of steaming water (sic)...

For the first few years the Hunters spent the Crow hunting season in Bozeman, as the Crow were not around, and the danger from bands of Sioux and Blackfoot was greatly increased. In 1874 the springs were attacked by Sioux. The Dr. and his son, Davis, were working in a field about one quarter mile from the house. Dr. Hunter ran toward the Indians to get his gun and they gave way, evidently thinking him crazy. Davis was shooting at them all the while, and when the Dr. reached his gun and began firing, the Indians went on down the river to the Gage Ranch where they killed four cattle.

Dr. Hunter sold his rights in 1885 to Murray interests in Butte. A large resort hotel and plunge was then constructed which was widely patronized until it burned in 1933. At the peak of development in 1909 the hotel could sleep 300 guests. The plunge is presently enclosed by a quonset hut and not used by the public. It was closed to the public in 1974. Location: SW¼, Sec. 9, T. 1 S., R. 12 E., P.M.M.

12. Recreation

Although recreation use data are not available for the Study Area, the area has good potential for antelope, deer and game bird hunting. The Yellowstone River in this area provides a fishing opportunity of national ("blue ribbon") significance, and Duck Creek and other small creeks provide additional fishing.

13. Other Land Use

a. General

The major land uses of the area under consideration are livestock grazing, wildlife habitat and recreation. The

closest residential area is the community, Springdale, approximately 2 miles east of Tract #1 and 1 mile west of Tract #2. Livingston lies 15-17 miles southwest of these tracts.

b. Mining

Mining activity is extremely limited in the area and presently there are no active mines on either site.

c. Industrial

There is no industry in the area (except for livestock grazing) and we know of no plans for industrial development other than the geothermal exploration and development that is the subject ot this EAR.

d. Planning and Zoning

The counties of Park and Sweetgrass are presently in the process of establishing active planning boards. At present they have developed no zoning regulations but hope to have established some type of land use plans within the next five years. They are also contemplating a comprehensive land use plan contract.

14. Socio-Economic Conditions

The proposed lease area is located in Park and Sweetgrass Counties. Park County's human population fell 15% between 1960 and 1970. The 1960 population was 13,168 and the 1970 population was 11,197. It has been estimated that the 1980 population will be 9,201 if 1960-70 migration trends persist through the 1970's.

Roughly 60% of Park County residents were classified as urban in 1970. The median age of 36.3 significantly exceeded the Montana median of 27.2 years. The population was highly homogeneous in 1970. Only 32 Indians and 27 other non-whites were identified in the 1970 census. There was little difference between Park County adults (12.2 years) and Montana adults (12.3 years) in median years of education completed.

Sweetgrass County's population was 3,290 in 1960 and 2,980 in 1970, a drop of 9.4%. If 1960-70 migration rates continue through

1980, it has been projected that the county's population will be 2,665 at that date. Sweetgrass County had no 1970 urban residents. Roughly twice as many residents were classifed as rural non-farm than rural farm, however.

Like Park County, Sweetgrass County's 1970 population was considerably older than the State's. The median age was 36.8. Two Indians made up the minority segment of the population. Adults had the same median years of education (12.2) as Park County adults.

Economically, the two counties differ in their dependence on the various sectors. Labor and proprietors' earnings in 1971 totalled $25,985,000 in Park County. Transportation, communications, and public utilities (25.2%), services (14.7%), farm (14.6%), and wholesale-retail (13.9%) were the leading contributing sectors to the earnings total. Sweetgrass County 1971 earnings were $7,732,000, with farm (41.5%), government (15.4%), and wholesale-retail (14.8%) the leading sectors. Per capita income in 1973 was $4,172 in Park County and $4,685 in Sweetgrass County. Montana's level was $4,626.

In terms of infrastructure, Park County had 4,648 occupied housing units in 1970, while Sweetgrass County had 1,387 units. The median values were $11,400 and $10,900 respectively. In 1973, Park County had one hospital with 54 beds and 11 physicians. Sweetgrass County had one hospital with 17 beds and two physicians. The persons per bed ratio was 407 in Park and 175 in Sweetgrass while the persons per physician ratio was 1,018 in Park and 1,490 in Sweetgrass. Comparable figures for Montana were 196 (persons/beds) and 843 (persons/physicians) in 1973. There were 1,786 elementary and 936 high school students (with 132 teachers) enrolled in Park County schools in 1974-75. Sweetgrass County had 406 elementary and 216 high school students (with 38 teachers) in the 1974-75 school year.

15. Ecological Relationships

The current ecological relationships can best be discussed in terms of the topography and vegetation that occur on the subject sites.

The general topography ranges from rolling foothills to deeply incised timbered drainages. Also included are broad grassland

plateaus. The principal vegetative species are wheatgrasses, fescues, and needle-and-thread grass. The drainage bottoms have juniper and pine, mainly scattered along the south facing slopes. There are also a variety of shrub and forb species. Shrubs include hawthorn, serviceberry, chokecherry, swanberry and others. Forbs are less abundant but include western yarrow, clubmoss, lupine, and phlox.

This area, lying at a relatively high elevation, receives more precipitation and produces more forage than the plains grassland. It is, in fact, one of the best forage types in the state.

There are very many vegetative subtypes and transitional forms so there often is not a clear division between vegetative types. Furthermore, many plants and animals are found in two or more types. The major vegetative species have been named in the preceding sections and will not be repeated here. Some discussion of ecological relationships is also found in those sections.

Many mammals and birds range throughout all types. Deer, for example, use each type in sequence: succulent new brush sprouts in the spring, browse in the fall, and herbaceous forage whenever they can get it. Large predators and some smaller ones also tend to follow their prey through all vegetation types. Many small creatures: mice, moles, shrews and songbirds, for example, tend to have a specific niche in a single vegetation type. These species with specific habitat requirements are more vulnerable to ecosystem disturbance than the more adaptable kinds.

Under natural conditions, interrelationships tend to be very stable. Changes take place slowly as new species evolve and find their place in the associations. Man, of course, has the capability to accelerate the process of change.

B. Future Environment Without Project Implementation

The purpose of this section is to describe environmental changes that can be expected within the Study Area if geothermal development does not take place. The analysis of impacts, which starts on page 41 will look at (1) impacts of development if the federal lease is

denied and (2) additional impacts if the federal lease is granted. It is an assumption of the analysis that geothermal exploration and development (if feasible) will take place whether or not the lease is granted.

In the absence of geothermal development, the environment in the vicinity of Hunters Hot Springs is not expected to change significantly in the foreseeable future. Climate changes will occur, but they are expected to be too small to demonstrate statistically. Air quality can be expected to worsen for a decade or two and then improve as enforcement of state and federal standards becomes more efficient. These changes are expected to be so small, however, that measurement will be difficult or impossible.

The topography and geology of the area are not expected to change. Nor are the soils and hydrology expected to change significantly although they will be impacted by land management practices. Whether these impacts will be positive or negative is unknown.

Plant and animal populations in the area are not expected to change very much. Plant communities protected from disturbance will gradually change toward climax types.

The remaining categories described under the Existing Environment -- noise, aesthetics, prehistory, history, recreation, other land use, socio-economic conditions and ecological relations are also not expected to change significantly during the next several decades if geothermal development does not take place.

IV. ENVIRONMENTAL IMPACTS

Although this section assumes implementation of the standard operating procedures for environmental enhancement or impact reduction as described in Section II, C, 5, problems arising from human error/system failure are also discussed when deemed relevant.

For each component discussed under the Existing Environment, this section discusses impacts by stage of implementation (exploration, development, operation, and close-out). To facilitate understanding of the incremental impacts of leasing these tracts, impacts are discussed under two headings: (1) Impacts of the applicants proposed action if the lease is denied, and (2) Additional impacts of the applicant's

proposed action if the lease is granted. It is an assumption of the analysis that geothermal exploration and (if feasible) development will take place in the area whether or not the lease is granted.

A. Climate

We believe that there would be no impact on the basic climate of the Study Area and surrounding region if the proposed action is implemented. Granting or denying the lease will not modify this impact or lack of impact.

Micro-climates would, of course, be impacted by geothermal development, the periodic discharge of steam being the major source of impact. These impacts will be discussed under those environmental components that are affected by changes in microclimate.

B. Air Quality

1. Exploration

a. Impacts of the Applicant's Prposed Action if the Lease is Denied

There would be three basic forms of air pollution related to exploration: gases, steam and particulate matter. Presently in the absence of steam or vapor from the Hunters Hot Springs the toxic levels in possible non-condensible gases or vapors are unknown. (For a discussion of possible toxicity levels, see Final Environmental Statement for the Geothermal Leasing Program, U. S. Department of the Interior, Volume 1, page 111 - 14, (1973).

Exploratory impacts from geothermal steam gases or vapors will be primarily from drilling, Properly executed drilling procedures will eliminate or minimize the possibility of escaped gases from test wells.

Particulate matter (dust) will result from off-road vehicle use, road and trail construction and drill pad construction.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

If the lease is granted, impacts on air quality could,

depending upon the location of exploration, be concentrated on the lease sites. However, we believe the consequences of locally severe changes in air quality would not be any worse on the four lease tracts than anywhere else in the Study Area.

The impact of changes in air quality on other environmental components will be discussed under those components.

2. Development

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

The escape of gases and vapors into the air is greater in this stage than any other. Several wells would be drilled and tested before any are put into production. To determine flow characteristics and to clean out the hole, each new well is vented to the atmosphere. Impact on air quality will probably be slight. At Hunters Hot Springs, however, toxic levels are unknown.

Hydrogen sulfide content or spring production is not known but it is assumed the characteristic "rotten egg" odor will be noticeable though not dangerous.

Development will also call for the establishment of geothermal pipelines. Transporting steam through a pipe will undoubtedly result in leaks and escape of steam into the atmosphere.

Drill pads will be needed for each well. Clearing these pads of brush and disturbing the soil will cause dust during the clearing operation and windy periods. Plant construction, road development, and power transmission lines will result in surface disturbance and contribute particulate matter (dust) to the air.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

No significant additional impacts are anticipated, except that the impacts might be concentrated on the lease sites.

3. Operation

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Geothermal steam can be released into the atmosphere at any stage during operation. New drill sites, maintenance of facilities, waste disposal (geothermal), and the production stage all have potential for allowing steam and toxic emissions escape.

Particulate matter would be an air pollutant factor only during new drill site development.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

See Exploration and Development, above.

4. Close-Out

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Removal of surface equipment would cause soil disturbance and resultant dust. Plugging and capping wells could result in small amounts of gas and vapor escaping into the atmosphere.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

See Exploration and Development, above.

C. Topography

1. Exploration

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Impacts from exploration would depend on the degree of surface disturbance. Road and trail construction, well drilling and vehicle use would impact topography, but not significantly.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

No significant additional impacts are anticipated, except that the impacts might be concentrated on the lease sites.

2. Development

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

The impact on topography due to soil disturbance during development would be essentially the same as for exploration although somewhat expanded due to power plant, water pit, pipeline and powerline construction.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

See Exploration, above.

3. Operation

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Subsidence might occur as geothermal fluids are removed from the ground during production. The probability of subsidence occuring in this area is unknown.

If waste waters are reinjected, the probable effect would be to increase the number and decrease the severity of local earthquakes. If waste water is placed in evaporation ponds, removal of geothermal fluids would have the probable effect of decreasing the number and increasing the severity of local earthquakes. The effect these earthquakes might have on topography is unknown.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

The discussion above may apply, however, we believe it likely that seismic and subsidence reactions will be the same regardless where the resource is tapped.

4. Close-Out

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Equipment used to remove surface improvements could cause some surface disturbance. However, the impact on topography would not be significant.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

See Exploration, above.

D. Soils

1. Exploration

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Impacts from exploration would be based on the degree of disturbance. Road and trail construction, well drilling and vehicle use may alter soil depth and structure. "Scalping" of drill pad sites and soil compaction by vehicles will be the main causes of soil erosion.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

No additional impacts are anticipated, except that the impacts might be concentrated on the lease sites.

2. Development

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Soil disturbance during development would be essentially the same as for exploration although somewhat expanded due to the power plant, water pit, pipeline and powerline construction.

The accumulation in the soil of toxic elements from emitted vapors and effluents is a possibility the probability and impact of which cannot be predicted.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

See Exploration, above.

3. Operation

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

The development of new drill sites during the operation stage would expose soil and cause some erosion. Evaporation ponds for waste water will require soil excavation. This will alter soil structure and depth and cause minor erosion.

The accumulation in the soil of toxic elements from emitted vapors and effluents is a possibility the probability and impact of which cannot be predicted.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

See Exploration, above.

4. Close-Out

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

At the end of production, the equipment used to remove surface improvements will undoubtedly cause surface disturbance. Agin, as in the construction phase, slight effects on soil depth and structure will result in some erosion. Surface restoration may also cause temporary soil impacts.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

See Exploration, above.

E. Geology

No significant impact on the geology of the area would be anticipated during any of the four stages of implementation. It should be noted,

however, that the drill holes would penetrate various geologic structures and the possible earthquakes and subsidence discussed in the Topography section, above, may modify surface and subsurface structure. The earthquake and subsidence would be the same whether or not the lease is granted. Denial would prevent drilling on the lease tracts, but we do not believe this would impact the geology significantly.

F. Hydrology

1. Exploration

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Surface water on the lands in the lease applications is limited to runoff from snowmelt and rainfall. The Yellowstone River flows through the area of investigation, however. Exploration activities that would affect the surface water include construction of roads, preparation of the drilling sites, and test drilling. Soil and subsoil particles disturbed by these actions would be available to be transported by runoff to the Yellowstone. Soluble salts in the disturbed soil and subsoil would be subject to leaching by the runoff. The surface water from the disturbed lands would be received by the Yellowstone at irregular intervals of snowmelt and rainfall.

Ground water beneath the area of investigation essentially would not be affected by exploratory work on the proposed leases or the adjacent land. The well casing would prevent co-mingling of the ground waters from the different aquifers. Steam or hot water under artesian pressure could rise to the surface in exploratory wells, however, and could impact the air quality and (or) the quality of surface runoff to the river. It is estimated that this discharge could amount to as much as 750,000 gal/day/well.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

Increasing the exploration area would increase the possibility of a blowout by increasing the number of wells.

2. Development

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

The impacts of development of geothermal energy on surface

water are related to the drilling program and to accidents in conveying hot water or steam through the industrial complex from withdrawal to replacement. Steam or hot water leaking from the well head or pipelines will be cooled and condensed; in sub-freezing weather it will tend to form ice that, upon subsequent melting, will be an addition to surface water from the sites. The added surface water will have a higher concentration of dissolved solids than the noraml snowmelt and rainfall, and the concentration may be higher than that of most of the ground water presently used.

Test wells drilled in the development phase should have little effect on ground water in the shallow aquifers if the casings of the wells are capable of resisting corrosion and pressure stress produced by hot, confined, and possibly chemically exotic ground water. If the casings fail by corrosion or rupture, the water in the well will be able to invade adjacent aquifers and mix with their contained water. Impacts could range from simple additional recharge to the upper aquifers to water-logging and cratering of the well site, with attendant possibilities of blow-outs or "geysers". Potential waste water volumes from blow-outs would be similar to those given under Exploration, above.

The pits indicated as disposal sites for water from the test wells will be potential sites for infiltration of produced water to the soil zone and to the shallow aquifers. The pits would be sealed, however, to prevent the delivery of water of possibly undesirable quality to the aquifers. (GRO Order #4)

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

See Exploration, above.

3. Operation

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Operation of the geothermal plant would have essentially the same impacts on surface and ground water as the development

would, except where the disposal systems would be different. If the spent water is to be returned to the aquifer whence it came or to a different aquifer, the differences in chemical compositions, pressures, and temperatures of the water to be mixed could produce undesirable reactions. Various salts that could be precipitated within or adjacent to the screens of the injection wells could make them ineffective.

The release of pressure and water through drill holes may affect the surface expression of the geothermal field. The spring may dry up, may increase in volume, or may relocate. Predictions of drilling results, however, cannot be accurately made.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

See Exploration, above.

4. Close-Out

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Closing the individual wells would include plugging the boreholes and casings so that leakage from one aquifer to another or to the surface would be prevented. Successful plugging would eliminate any impacts on surface water or ground water.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

None identified.

G. Plants

1. Exploration

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Off-road vehicle use would crush some plants and cause limited destruction. Road and trail construction and building drill

pads would eliminate vegetation from localized sites. The localized impact would be high; but, overall, the effect on the plant community would be slight. Rehabilitation after exploration would have a beneficial impact and may result in greater plant density than existed prior to disturbance, but species composition would be different for many years.

Toxic vapors, if present, could adversely impact plants during exploration.

There is the possibility that a blowout during exploration would introduce hot and possibly toxic water into the Yellowstone River. Depending upon the volumes, toxicities, and temperatures involved, this could seriously impact aquatic vegetation and other components of the River's ecosystem. Because of the importance of the Yellowstone River, a special discussion of the probability of a blowout, the water volumes and toxicities that could be expected, the measures that would be taken to prevent a blowout from occuring and the measures already required as standard operating procedures to handle a blowout should it occur, plus additional mitigation recommended as a result of this analysis, are discussed starting on page 61 within the section on mitigation.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

Depending on the location of exploration, impacts on plants could be concentrated on the lease site if the lease is granted. However, we believe that impacts on plants would not be any more severe on the four tracts than elsewhere in the area.

2. Development

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

The impact of development on plants would be the same as that of exploration except that it will be more intensified because of increased surface disturbance. The possibility of vegetation damage from toxic vapors will be increased but still low.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

See Exploration, above.

3. Operation

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

The establishment of new drill sites and geothermal fluid waste disposal ponds would eliminate the vegetation on these localized areas.

The possibility of vegetation damage from toxic vapors would exist.

It may be possible to establish aquatic vegetation in and around the geothermal waste evaporation ponds.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

See Exploration, above.

4. Close-Out

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Removal of the geothermal plant would have a detrimental impact on grasses, forbs, and shrubs. The impact would be slight because equipment can be moved over established roads. Surface reclamation and restoration should mitigate much of this impact.

If aquatic vegetation were established during the operation phase, close-out would impact it by reducing the water supply. Removal of the ponds would, of course, remove the aquatic vegetation. However, since no geothermal development has proceeded to the close-out stage yet, it is not known if the ponds would be removed or maintained.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

See Exploration, above.

H. Animals

1. Exploration

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

This phase would have relatively minor impacts on animals. Off-road travel and scarification of drilling sites and disposal ponds would destroy habitat of some invertebrates and mammals as the small home ranges such as the pocket mouse (Perognathus sp.). However, the impacts would not be significant in terms of the total local populations of these animals and in most instances the impacts would be temporary.

Exploration activities during the spring could disrupt reproductive activities or for example, antelope kidding grounds and sharptail grouse strutting grounds. Some of the areas where this is most likely to take place are outlined in Figure 4.

There is the possibility that a blowout during exploration would introduce hot and possibly toxic water into the Yellowstone River. Depending upon the volumes, toxicities, and temperatures involved, this could seriously impact fish, furbearers, waterfowl and other components of the river's ecosystem. Because of the importance of the Yellowstone River, a special discussion of the probability of a blowout, the water volumes and toxicities that could be expected, the measures that would be taken to prevent a blowout from occurring, and the measures already required as standard operating procedures to handle a blowout should it occur, plus additional mitigation recommended as a result of this analysis, are discussed starting on page 62 within the section on Mitigating or Enhancing Measures.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

No significant additional impacts on animals are anticipated if the lease is granted. Impacts could, depending upon the location of exploration be concentrated on the lease

sites. However, we believe the impacts on the two tracts applied for would be no worse and perhaps less than the impacts that would occur on other sites within the Study Area. This conclusion is supported by the Map of Wildlife Concentration Areas (Figure 4).

The two tracts suspended from the lease (Tracts 3 & 4) are relatively important, particularly as deer winter habitat. Leasing them could increase the impact of exploration on deer.

2. Development

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Although even less likely than during exploration, a blowout could occur during development. See Exploration, above for a discussion of that eventuality.

Impacts of development on animal populations in the Study Area would be fairly significant. If three power plants and associated facilities were constructed dominating three sections within the Study Area as assumed in this analysis, some 535 acres would be disturbed (See Table 2 page 21). The population of small mammals, reptiles, and other animals with small home ranges on the disturbed sites would be eliminated. However, although this would amount to a larger number of individual animals, total populations within the Study Area would not be significantly affected.

The impact of development on the larger or more conspicuous animals would be more severe than the impact on the smaller species. The severity of habitat losses would depend upon the location of development with respect to the Wildlife Concentration Areas. Development within deer and antelope winter range, for example, greatly reduce or eliminate use by those species. It is likely that the increased human population during development would result in hunting and harrassment that would disturb the more conspicuous species as much as the impacts on habitat.

Noise during development would cause certain animal species to vacate the development and surrounding areas.

Electric transmission lines may attract bald eagles and other raptors. There is always the possibility of raptors being electrocuted.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

No significant additional impacts on animals are anticipated, if the lease is granted. See Exploration, above, for additional discussion.

3. Operation

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

Impacts on animals during operation would be similar to those described under development. Some benefits to both aquatic and terrestrial animals would occur if holding ponds of quality water can be maintained.

Although even less likely than during exploration, a blowout could occur during operation. See Exploration, above, for a discussion of that eventuality.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

No significant additional impacts on animals are anticipated during operation, if the lease is granted. See Exploration, above, for additional discussion.

4. Close-Out

a. Impacts of the Applicant's Proposed Action if the Lease is Denied

To the degree that pipelines, power plants, etc., were removed and restoration efforts made, habitats would tend to return to their original condition. However, scars would remain and it is doubtful that the human population and associated wildlife harrassment would decrease significantly.

b. Additional Impacts of the Applicant's Proposed Action if the Lease is Granted

None have been identified.

I. Noise

If the lease is denied noise from air drilling and production testing during exploration, development, and operation would be intense (100 - 125 decibels @ 25 feet) and approximate the levels of an unmuffled diesel truck. This would detract from the enjoyment of the area by visitors and might limit the suitability of nearby land for some development uses. All stages of implementation, including close-out would involve the noise of construction and vehicular travel, but we do not believe this would be a significant impact.

We foresee no additional impacts from noise if the lease is granted.

J. Aesthetics

If the lease is denied, exploration, development, operation and close-out could have an adverse impact on the harmonious aspect of the environment. Drill rigs, trucks, and testing equipment will cause visual distraction from the landscape during the exploration phase. Plant construction, geothermal steam pipelines, and electric transmission lines will detract from the visual environment at the onset of development and operation. The odor of hydrogen sulfide gas may detract from the enjoyment of the area by visitors. However, some of this odor is present at Hunters Hot Springs at the present time.

The presence of drill masts, exploration rigs, plant facilities and electric transmission lines may serve as a point of interest to travelers in the area. Drilling activity along I-90 on private ground may cause many of the traveling public to pull off the freeway for a closer look.

We foresee no additional impacts on the aesthetics of the area, if the lease is granted.

K. Prehistory and History

If the lease is denied impacts on archaeological sites are possible during all stages of implementation, except close-out, although no systematic survey has been made.

The Lewis and Clark Trail, old Bozeman Trail and Yellowstone Stage Route pass through the area. They are ill-defined but nevertheless could be impacted by the presence of a geothermal steam plant.

The impacts on historic and prehistoric resources from geothermal exploration, development, operation, and close-out activities are at this time unknown; both for the Study Area and four specific tracts. As stated in the Existing Environment section, there is a high probability that archaeological sites exist.

L. Recreation

If the lease is denied, recreation within the Study Area would be impacted during exploration, development, operation and close-out in proportion to the impact on animals (discussed above). A blowout that affected the fishery in the Yellowstone River could reduce the recreational value of the river significantly. (See page 62 within the section on Mitigation of a discussion on blowouts). Any pipelines, power plants, etc. constructed would decrease visual aesthetic values and reduce the value of recreational visits to the area.

No significant additional impacts on recreation are anticipated if the lease is granted.

M. Other Land Use

Development and operation would impact livestock grazing whether or not the lease is granted. It is estimated that approximately 600 acres of land would be distrubed should three 110 MW plants be erected. Considerably more land, however, may lose its potential for livestock grazing due to proximity to development. Exploration would not significantly impact grazing or any other land use. Close-out would allow some, but probably not all of the land to return to grazing use.

If geothermal resources are developed, the area would experience a population increase and some new residential and commercial land uses.

N. Socio-Economic Conditions

It should be understood that there would be very little impact on humans directly from leasing. Most impacts would result from

the exploration and development activities which could follow leasing. Since these activities are relatively poorly defined at this time, in terms of area involved, timing, and technical detail, assessment of impacts on humans is imprecise.

This analysis will address the impacts of leasing and potential development in the Study Area. This will permit assessment of the potential total impact of leasing and development. The involved National Resource Lands, totalling approximately 440 acres, make up only a small portion of the Study Area and leasing/development action or inaction in these tracts would only incidentally affect the overall impacts described.

This analysis presents the potential impacts. The probable impacts are much less, but quite speculative, depending upon the resource actually discovered, the economic conditions of the nation in general, and the energy market in particular.

Mention should also be made that the original analyses of socio-economic changes precipitated by geothermal development have been based on the Geysers area north of San Francisco. Discussions with industry representatives and state-federal agency personnel indicate that the overall relationship between development levels and socio-economic factors are roughly linear.

The Study Area could potentially support three 110 megawatt power plants. Total electrical production could thus be approximately 330 megawatts. This is the amount of electricity presently required by a city of 3-400,000 persons.

If this area was to be developed over a two to three year period, there would be an estimated 40-50 persons employed on two to four drilling rigs. In addition, another 60-80 persons would be employed in the construction of each power plant. There would likely be considerable overlap between the drilling and construction stages and between the construction of the three plants. Both drilling and construction employment would be seasonal to a considerable extent, with winter layoffs likely.

Pacific Gas and Electric estimated, as part of an environmental assessment process, the direct and indirect employment and income effects of a single 100-megawatt power plant in the Geysers area. These tables are attached to further assist the reader. However, it should be emphasized that the employment earnings estimates are confined to <u>one</u> power plant and do not include drilling and other field activities.

During the production stage, about 10 persons per 100-megawatts would be employed in the plants proper. Another 10 persons would be required to maintain the field and piping system per plant. This totals to a production work force of roughly 60 persons.

The local labor pool, presently dominated by agriculture and service-type job holders, could not supply the necessary skills in the needed quantities. Therefore, almost all of this labor would be in-migratory to the area. This in-migration of employees, and the associated indirect population increase, would exceed the capacity of the area's infrastructure systems (schools, health care, water-sewer, utilities, housing, etc.), except possibly transportation. Housing, in particular, would be a serious supply problem most likely met through large-scale temporary (mobile homes) housing developments.

The greatest negative impact in Park and Sweetgrass Counties would likely be centered upon low and fixed income persons and families. They would face increased competition for housing and similar goods/services subject to short supply and/or inflationary rates above "without-development" rates.

Revenues to the local governments from property taxes would lag several years behind the costs incurrec to respond to the population increase. Mobile homes would be subject to taxation but would have less value than permanent housing.

Community lifestyles would be affected by the influx of new persons. Geothermal development would bring with it both quantitative and qualitative changes in the population. The pace of population growth would be increased dramatically, at least during the field development stage. Moreover, the semi-skilled and skilled workers employed in drilling and plant construction would bring with them different values, attitudes, and styles of life than those possessed by present residents. Given these differences, it is likely that institutional (family, policy, socialization, religion, recreation) tensions between present residents and newcomers would be evident, particularly during the development stage of the field.

Socio-economic impacts, as described above, would be essentially the same whether or not the lease is granted.

O. Ecological Relationships

Any impact on the environment can, and probably will, have an impact on some ecological relationship. Although there is no clearcut dividing line, this section will treat those possible impacts which affect different parts of an ecosystem differently; which, for example, affect one animal or plant differently than another animal or plant. It must be said at the outset that there is no evidence available now to indicate that there will be any significant impacts of this kind as a result of geothermal development. However, because ecological relationships are complex, and because so little is known about many of them, the possibility of serious impacts cannot be dismissed. The possible impacts described below are examples of things which could happen rather than a reasonably full list.

Also, since the magnitude of the impact required to bring about a particular effect is so poorly known, all the alternatives except nonleasing are roughly comparable.

1. There is some evidence that steam (or impurities in it) can injure or kill plants, and that some species are more susceptible than others.

2. An effect is possible from changes in the ground water regime caused by earth moving and waste water disposal.

3. Non-native grasses, forbs and shrubs will be introduced to control erosion. It is possible that some of these species will become naturalized and will replace some native species. However, many exotic species have already been introduced, including most of those likely to be used in the geothermal operations, for various reasons in the past 100 years. No significant impacts from this cause are likely.

4. The abundance of predator or prey species may change in relation to the other. If a predator is reduced or eliminated the prey species may overpopulate its range. On the other hand, if prey species numbers are reduced too much a predator species may leave the area entirely, again leading to overpopulation by the prey species. The same reasoning applies to insects and to plants as well as to mammals and birds.

5. Another kind of impact affecting relationships concerns mobility. The network or roads, pipelines, drill pads, transmission lines

and power plants may have an unequal effect upon the ability or opportunity of some species to move through the area. If predator or prey species are affected differently, their relationships may change.

6. A phenomenon being studied more intensively lately is acid rain. This condition is caused or aggravated by many technological processes, including geothermal activities. Too little is known about the causes and effects of this to predict if geothermal activity alone will have a significant impact on ecological relationships.

7. The increasing presence of man, no matter what kind of activity he may be undertaking, may drive away the shyer species altogether. This conceivably could happen, for example, to the mountain lion, which is notoriously shy, although it is rare or absent in the area under discussion.

8. Increased seismicity caused by geothermal activity might disturb some animal species enough to make them leave the area.

9. Deposition of silt in aquatic communities may smother and kill small organisms and affect a food chain such as (highly simplified) insect larva to trout to osprey.

V. MITIGATING OR ENHANCING MEASURES

This section assumes implementation of the standard operating procedures as required, and does not repeat, except for clarity and emphasis, mitigating measures included in the description of the applicant's proposed action and Appendix III. The following measures are considered to be technically feasible and reasonably available. These mitigating measures are those which could be applied on federal lands.

1. Off-road Vehicle Travel

Restrict off-road vehicle travel in the spring or after heavy rainfall when the soils are wet and muddy. Limit vehicle travel to established roads and trails wherever possible.

2. Drilling-Accidental Discharge

To date no accidental blowouts have occurred in the United States in the exploration phase of the hot water geothermal systems. It is estimated that as much as 750,000 gal/day may enter surface drainages in the event of accidental discharge.

In addition to the blowout prevention measures of GRO Order #2, a blowout prevention program and contingency plan must be submitted with the applicant's Permit to Drill.

Blowout prevention measures in GRO Order #3 include:

a. Blowout preventers and related well control equipment to be installed, tested daily, and maintained ready for use until drilling operations are completed.

b. Drilling fluid control

c. Drilling fluid testing

The drilling of shallow holes is covered in GRO Order #1. Specific requirements include:

a. Flow line temperatures shall be taken at frequent time intervals during drilling operations on shallow holes drilled with mud. If flow line mud temperature should reach 52°C without special cooling, drilling ahead shall cease immediately and the hole will be either:

   (1) Completed as an observation well.., or

   (2) Abandoned by filling the hole with drilling mud from total depth to 3 metres below the surface and cement to the surface thereafter.

During drilling operations, exceptions will be allowed only with specific permission from the supervisor.

b. If flowing steam or hot water at 65°C is encountered, further drilling shall stop immediately and the hole will be either:

   (1) Completed as an observation hole using steel tubing cemented from total depth to surface, or

   (2) Abandoned by plugging with cement from total depth to surface.

Exceptions will be allowed only with specific permission from the supervisor.

c. The lessee shall submit the following information with the Notice of Intent to Conduct Geothermal Resource Exploration Operations (Form 3200-9):

(1) The approximate location . . . . of each proposed hole and order of drilling;

(2) The type and size of drilling rig;

(3) The proposed drilling program including drilling method...;

(4) The type of drilling sump and proposed method of sump abandonment;

(5) The approximate time holes will be used for observation; and

(6) The proposed method of abandonment.

d. Locations proposed in natural thermal areas ... or in areas of known artesian flow, will require a drilling program for each hole, approved by the supervisor. Such holes may require special drilling and completion techniques (such as cemented surface casing and simple expansion type blowout preventers) to safely control formations containing geothermal or other resources which may be penetrated.

e. Holes shall be abandoned in a manner that will prevent subsurface inter-zonal migration of fluids and surface leakage.

General Environmental Protection is covered in GRO Order #4, and includes the following statements and requirements:

a. Protection of the environment includes the lessee's responsibility to assure that exploration and development operations will be conducted with the maximum protection of the environment; that disturbed lands will be rehabilitated; that precautions will be taken to protect the public health and safety; and that the lessee shall fully comply with the spirit and objectives of the National Environmental Policy Act of 1969, and other Federal environmental legislation and supporting Executive Orders.

b. Pollution Prevention - in the conduct of all geothermal operations, the lessee shall not contaminate any natural waters, adversely affect the environment or materially damage the aesthetic values of the leased or adjacent property.

(1) Liquid Disposal. Liquid well effluent or the liquid residue thereof containing substances, including heat, which may be harmful or injurious in any manner shall be reinjected into the geothermal resources zone or such formation as is approved by the Supervisor.

Drilling fluids shall be disposed of at approved disposal sites or in such other manner as approved by the Supervisor.

(2) Solid Waste Disposal. Drill cuttings, sand, precipitates and other solids shall be disposed of as directed by the Supervisor either on location or at other approved disposal sites. Mud and chemical containers and other solid waste materials shall be disposed of in specified places.

(3) Gas Disposal. Noncondensible gases such as carbon dioxide, ammonia and hydrogen sulfide may be vented or ejected into the atmosphere, provided however, that the volume and the measured concentration of such vented gas or gases shall not violate Federal, State or local air pollution standards.

(4) Pits and Sumps. Pits and sumps shall be lined with impervious material and purged of environmentally harmful chemicals and precipitates before back-filling. In no event shall the contents of a pit or sump be allowed to contaminate streams, lakes and ground waters or adversely affect the natural environment of the area or damage the aesthetic values of the property. When no longer used or useful, pits and sumps shall be back-filled and the premises restored to a near natural state or an improvement thereon as prescribed by the Supervisor.

c. Inspections and Reports - Lessees shall comply with the following pollution inspection and reporting requirements:

(1) Pollution Inspections. Drilling and production facilities shall be inspected daily by the lessee. Appropriate preventative maintenance shall be performed as necessary to prevent failures and malfunctions which could lead to pollution. Suspended wells, completed nonproducing (idle) wells and areas or fields not under production shall be inspected at intervals as prescribed by the Supervisor. Necessary repairs or maintenance shall be made as required.

(2) Pollution Reports. All minor leakage or spills in violation of Federal, State or local pollution standards shall be reported orally within 24 hours to the appropriate Geothermal District Supervisor, and shall be followed within 10 days thereof by a written report stating the cause and corrective action taken.

All substantial spills or leakage of pollutants and those of any size or quantity which cannot be immediately controlled of any significant effect on the environment created by the lessee's operations shall be reported orally within 24 hours to the Supervisor. The lessee shall then submit a written report within 30 days, stating the cause and the corrective action taken.

Emissions into the atmosphere of noncondensible or toxic gases such as hydrogen sulfide and ammonia shall be reported as hereinabove required for minor or substantial leakage.

d. Injection - The use of any subsurface formation; including the geothermal resources zone, for well effluent disposal, the residue thereof or for the injection of fluids for other purposes such as subsidence prevention, shall not be permitted until the lessee has submitted a plan of injection covering the proposed injection project and has subsequently received the Supervisor's written approval thereof.

(1) Plan of Injection. The plan of injection shall include the quantity, quality and source of the proposed injection fluid; the means and method by which the fluid is to be injected; a structure map contoured on the intended injection zone; and cross-sections showing producing well locations and the proposed injection well location(s). A copy of the lessee's plan of injection shall be submitted to adjacent lessees if required.

(2) Injection Report. The lessee shall file in duplicate with the Supervisor a Monthly Water Injection Report on a form prescribed by and available from the Supervisor. The subject report shall be filed on or before the last day of the month following the month for which the report is filed.

(3) Inspection. Injection wells and facilities shall be inspected at intervals as prescribed by the Supervisor to

ascertain that all injected fluids are confined to the approved injection zone. A spinner survey, a radioactive tracer survey and a cement bond log may be required on each injection well within 30 days after injection begins. The lessee shall furnish to the Supervisor two legible copies of any and all such surveys and logs. In the event of a casing failure, inadequate annular cement or other mechanical failure, the lessee shall without unreasonable delay repair, suspend or abandon the well.

In the event of blowout prevention failure, however, hot, potentially toxic fluids escape to the surface. Surface water contamination may be partially mitigated by:

a. Construction of a berm surrounding the immediate drilling area. This would retain potentially toxic fluids, or

b. Construction of a tank or sump of sufficient size to retain toxic fluids for evaporation or reinjection,

c. Monitoring water quality parameters of the Yellowstone River above and below the lease area, and

d. Drilling on the shallowest slopes and as far as possible from the Yellowstone River and it's tributary drainages.

3. Archaeological Resources

Prior to any surface disturbance an intensive archaeological field reconnaissance must be conducted to locate, describe, and evaluate all cultural resources, located within the planned operational area of the lease. See Appendix I, Archaeological Resources.

4. Transmission Lines - Raptor Protection

Power lines shall be constructed to be raptor safe using the most up to date technology. The design to be approved by the Supervisor and Bureau of Land Management. Refer to Appendix VII.

5. Wildlife-Terrestrial

a. Do not allow exploration activities to occur from December 1 to June 1 on tracts 2, 3, & 4, because these areas are designated

as mule deer winter ranges with adjacent antelope winter ranges.

b. Do not allow development or intrusion on tracts 2, 3, & 4 because these areas are designated as mule deer winter range with adjacent antelope winter ranges.

c. Construction of facilities such as pipelines and fences will be designed so they will not interfere with wildlife movement.

6. Road Construction

Temporary roads for powerline construction will be of a lower standard than moderately travelled roads and need no surfacing.

7. Drill Site Development

Drill sumps should be fenced or measures taken to protect humans, livestock, and wildlife if toxic substances are used or encountered in the drilling process.

8. Waste Disposal

If the water quality is good, steps should be taken to develop aquatic habitat for birds, fish, and amphibians. If the water is toxic, steps should be taken to prevent poisoning of animals and humans.

9. Endangered or Threatened Species

a. All endangered or threatened wildlife species should be provided the protection necessary for their survival, in compliance with the 1973 Endangered Species Act (Public Law 93-205, 87 Stat. 884).

b. If future investigation determines any endangered or threatened fish and wildlife species exists in or uses the area, a program to determine their status and habitat needs should be established.

c. In the case of the occurrence of any animal that the Secretary of the Interior or the appropriate State fish and game management agency lists as "Endangered" or "Threatened", there should be established a "critical habitat zone" (CHZ) to ensure the protection of said animal; such zone generally to consist of an area exempt from any and all operations within a safe distance (depending on species), and held inviolate to any intrusion except under special authorization by the land managing agency, with concurrence from the appropriate State fish and game agencies and the U. S. Fish and Wildlife Service. The

actual size and location of the "critical habitat zone" should be determined jointly by personnel from the appropriate State fish and game agency and the U. S. Fish and Wildlife Service upon an evaluation of the topography, vegetation, and specific needs of the species involved; and the establishment of these zones should be done on an individual site-by-site basis.

d. If, at a later date, the size or location of a "critical habitat zone" should be found to be inadequate, a reevaluation should be made so that adequate protection will be provided the species involved, even though lease revocation may be required.

e. There should be a continuing, coordinated effort by the U. S. Fish and Wildlife Service, the appropraite State fish and game managing agencies, and the specific land management agency involved, to periodically survey and inventory populations within the critical habitat zones to determine the status of endangered and threatened species and to locate any new nests, roosts, or other critical areas so that these too will be protected.

The Geothermal Resource Lease (Appendix III) includes the following remedy in case of default:

Sec. 25. REMEDIES IN CASE OF DEFAULT

(a) Whenever the Lessee fails to comply with any of the provisions of the Act, or the terms and stipulations of this lease, or of the regulations issued under the Act, or of any order issued pursuant to those regulations, and that default shall continue for a period of thirty (30) days after service of notice by the Lessor, the Lessor may (1) suspend operations until the requested action is taken to correct the noncompliance, or (2) cancel the lease in accordance with Sec. 12 of the Act (30 U.S.C. 1011). However, the 30-day notice provision applicable to this lease under Sec. 12 of the Act shall also apply as a prerequisite to the institution of any legal proceedings by the Lessor to cancel this lease while it is in a producing status. Nothing in this subsection shall be construed to apply to, or require any notice with respect to any legal action instituted by the Lessor other than an action to cancel the lease pursuant to Sec. 12 of the Act.

(b) Whenever the Lessee fails to comply with any of the provisions of the Act, or of this lease, or the regulations, or of any

GRO Orders, or other orders, and immediate action is required, the Lessor without waiting for action by the Lessee may enter on the leased lands and take such measures as it may deem necessary to correct the failure, including a suspension of operations or production, all at the expense of the Lessee.

(c) A waiver of any particular violation of the provisions of the Act, or of this lease, or of any regulations promulgated by the Secretary under the Act, shall not prevent the cancellation of this lease or the exercise of any other remedy or remedies under paragraphs (a) and (b) of this section by reason of any other such violation, or for the same violation occurring at any other time.

(d) Nothing herein shall limit or affect the Lessee's right to a hearing and appeal as provided in Sec. 12 of the Act and in the regulations promulgated thereunder.

(e) Upon cancellation, the Lessee shall remove all property in accordance with Sec. 24 hereof, and shall restore the leased lands in a manner acceptable to the Lessor or as may be otherwise required by the Lessor.

VI. UNAVOIDABLE IMPACTS

This section describes unavoidable impacts of the applicant's proposal if the lease is granted. This section also assumes implementation of all standard operating procedures described or referred to in the Description of the Proposal and all mitigating or enhancing measures described above, except 5,b. Unavoidable impacts discussed are those which cannot be feasibly mitigated and occur on, or because of activity on, the federal lease.

A. Climate

There will be no significant impact by granting the lease.

B. Air Quality

The release of H_2S and other gases into the atmosphere from venting and testing wells is an unavoidable adverse impact on air quality. The power plant and cooling towers release steam and contaminants. The cumulative impact of several power plants releasing steam and non-condensible gases into the local environment cannot be

predicted with accuracy from currently available data.

C. Topography

Earth movement required for construction of pipelines, roads, power plants, water sumps, etc., would have only a minor impact on topography. The probability of significant topographic impact from project-induced subsidence is believed to be negligible.

D. Soils

Unavoidable impacts would be the same as those discussed in the Environmental Impacts section with the exception that after exploration, if no development is anticipated, restoration will mitigate the impacts. After close-out rehabilitation of the site would mitigate most impacts.

E. Geology

Although drill holes would penetrate various geologic structures, and earthquakes and subsidence might modify surface and subsurface structure, no significant impact on the geology of the area is anticipated.

F. Hydrology

The possibility that toxic waters may reach the Yellowstone River cannot be completely mitigated. Unforeseen accidents may release fluids into underground aquifers or surface drainages. It is felt that mitigating measures included in the GRO Orders and in the Mitigating and Enhancing Measures section afford the maximum protection of surface and subsurface waters.

An unknown hydrologic impact would be the relationship between geothermal development and impact on Hunters Hot Springs.

G. Plants

As indicated in Tables 1 and 2, approximately 40 acres of plant life will be lost during the exploration phase and approximately 550 acres of plant production will be lost for the duration of the project.

H. Animals

Roads, pipelines, drill pads, transmission lines and power plants will result in a change in the carrying capacity of the area to

support wildlife species and populations. Populations of small mammals, reptiles, and other animals with small home ranges on the disturbed sites would be eliminated if development occurs on the leased tracts. Impact upon larger and more conspicuous animals would also occur depending upon the magnitude of the development.

Development upon the tracts will affect wildlife movement through the area. Additionally, noise pollution and non-condensible gases may exclude wildlife use within the area.

Increased human population during development will possibly lead to increased hunting and harassment of the more conspicuous species.

A blowout, if uncontained could result in contamination of the underground and surface water systems. Aquatic species within the Yellowstone River would be affected.

I. Noise

Unavoidable impacts are the same as those impacts described in the Enviornmental Impacts section, I; except that GRO Order #4 requires specific steps to be taken to lessen decibel output.

J. Aesthetics

Unavoidable impacts are the same as these impacts described in the Environmental Impacts section, J.

K. Prehistory and History

Appendix 1, Archaeological Resources will mitigate impacts on prehistoric and historic values with the exception of possible removal if Action Calss II or III reports are initiated.

L. Recreation

Any pipelines, power plants, etc., constructed would decrease visual aesthetic value and therefore reduce the value of recreational visits to the area.

M. Other Land Use

Unavoidable impacts are the same as those discussed in the Environmental Impacts section.

N. Socio-Economic Conditions

Unavoidable impacts are the same as those discussed in the Environmental Impacts section.

O. Ecological Relationships

Unavoidable impacts are not significantly different than those discussed in the Environmental Impacts section.

VII. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

For the purpose of this discussion, short term means the time during which the steam wells and lines, and the power plants and lines, are in operation, even though this might be hundreds of years.

Committing an area to power generation from steam means committing a portion of the earth's surface to that use. Incompatible uses would be precluded or reduced to some extent. The nature of this commitment and its potential environmental impacts have been discussed in some detail in previous sections of this analysis. Some additional general comments on the effect of the impacts on productivity are appropriate here.

The Steam Resource: By using up the steam (if in fact current production methods do use it up) it will not be available for future generations to use. It is possible, although highly speculative to predict, that some more productive use might be found, or that it might be used more efficiently for power generation as technology improves. Along the same line, improved technology might better be able to eliminate or mitigate environmental impacts if development were to be delayed.

The Surface: If the buildings, steam lines and power lines are ever no longer needed, it is possible to remove them and to reshape the land surface to a reasonable approximation of the original contours. Native vegetation and fauna would move into the area, either naturally or with man's assistance. Other surface uses, primarily recreation, which were reduced or eliminated by the action would again be possible. In the long run, therefore, the action appears to have little permanent effect of the productivity of the land surface. Areas such as rocky cuts which could not be rehabilitated would constitute a very small percent of the developed areas.

Off-Site Effects: To the extent that power is derived from steam it does not need to be generated frmom some other source. These other sources include oil or coal plants, atomic power or hydroelectric. (Other power sources may be developed during the life of this project.) Each kind of power generation has its own peculiar environmental impacts and consequent effect on productivity. A commitment to steam development means that the impacts associated with the alternate sources of power would not occur.

VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

A. Commitments if the Lease is Denied

1. Depletion of thermal energy and water from the geothermal reservoir. Both of these resources are probably renewable within an unknown time span after the life of the project.

2. Land subsidence may result from the removal of geothermal fluids.

3. Cuts and fills for plant sites could leave permanent landscape scars.

4. Soils lost through erosion would be lost for many years if not indefinitely.

5. Construction materials. This includes the steel, concrete, wood, gasoline and other resources that would be used in the construction of the three 110MW power plants and related facilities hypohthesized in this analysis.

6. Losses to wildlife populations would be irretrievable at least during the life of the project as would related recreational benefits.

7. Native plants and grazing. At least 600 acres of would be removed from grazing during the life of the project. Much of the vegetation on this 600 acres would be disturbed during the life of the project. Recovery would be slow.

8. Exploration, development, and operation would have an adverse impact on the harmonious aspect of the environment. This would continue for a considerable time, perhaps indefinitely, beyond the life of the project.

B. Additional Commitments if the Lease is Granted

There would be virtually no additional commitments of resources if the lease were granted. As explained in the analysis of impacts, certain resources on the lease tracts (ie, soils and small-animals) could be protected by lease denial. However, such denial would very probably subject adjacent private or state lands to similar impacts on those resources. Except for certain wildlife values on the two tracts (number 3 & 4) already suspended from the lease application, no situation has been identified in which impacts on the lease tracts would be greater or more significant than impacts on other lands within the Study Area.

IX. ALTERNATIVES

Because of the dependence of geothermal development in this area upon the results of exploration, specific plans for development have not been made. Therefore, alternatives such as different plant designs and different locations for plant sites are not relevant to the analysis since no plant designs or locations have been proposed.

The relevant alternatives are those facing BLM: (A) Decline to Lease, and (B) Postpone Leasing.

A. Alternative A - Decline to Lease

Analysis of this alternative has been incorporated directly into the analysis of impacts that begin on page 41. The gist of that analysis is that environmental impacts in the Study Area will be essentially the same whether or not the lease is granted. However, direct impacts to national resource lands would be avoided by denying the lease.

It should also be pointed out that a decision not to lease would be contrary to the intent of the Geothermal Steam Act and the attitudes and expectations of the interested Montanans. There are national expectations, as well, which have been greatly reinforced by the recent "energy crisis" and the federal government's declared intent to encourage development of new energy sources.

The analysis assumes that if exploration is successful geothermal development would take place whether or not the lease is granted. However, a decision not to lease could hamper efficient development of the resource on private land if the only developable sites turned out to be on or adjacent to the lease tracts. This is most unlikely,

however, because of the small percentage of national resource land in the area. Nevertheless, the companies working toward development of the area's geothermal resources, have been doing so with the expectation that the national resource lands would become available (without competitive leasing) to round out their production units.

B. Alternative B - Postpone Leasing

Under this alternative the Bureau would "wait and see" the actual environmental impacts of its initial leasing program in other areas of the United States on national resource lands. The impacts of this alternative are as follows:

The environmental unknowns of leasing in the Hunters Hot Springs area would likely be minimized using this approach.

Full geothermal development of the Hunters Hot Springs would be delayed for at least five years pending evaluation of other national resource land leases.

To postpone leasing, for whatever reason, would be contrary to both statewide and national attitudes and expectations of speedy government action on a critical energy program.

X. PERSONS, GROUPS AND GOVERNMENT AGENCIES CONSULTED

Requests for comments on the Hunters Hot Springs area were sent to the following. A copy of the material sent is attached in Appendix II. Replies received and comments are attached in Appendix V.

Radio Station KBMY
P. O. Box 20316
Billings, MT 59102

Radio Station KBMN
P. O. Box 1228
Bozeman, MT 59715

Radio Station KULR
P. O. Box 1875
Billings, MT 59103

Radio Station KPRK
P. O. Box 691
Livingston, MT 59047

Radio Station KBOW
P. O. Box 132
Butte, MT 59701

Radio Station KGHL
P. O. Box 1657
Billings, MT 59103

Radio Station KARR
P. O. Box 1139
Great Falls, MT 59401

Radio Station KMON
P. O. Box 1905
Great Falls, MT 59401

Radio Station KXXL
Route 2, Box 149
Bozeman, MT 59715

Radio Station KOYN
P. O. Box 956
Billings, MT 59103

Radio Station KFBB
P. O. Box 1139
Great Falls, MT 59401

Radio Station KUDI
P. O. Box 1405
Great Falls, MT 59401

Dr. Wilson Clark
Environmental Communications Council
EMC
Billings, MT 59101

Gary Wicks
State of Montana Dept. of Nat. Res.
32 S. Ewing St.
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Wilderness Society
Montana Wilderness Assoc.
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Lincoln, MT 59639

Robert Duncan, Administrator
Resource Development Division
State Capitol
Helena, MT 59601

S. L. Graff, Director
Montana Bureau of Mines and Geology
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Vernon E. Sloulin, Chief
Environmental Services Bureau
Board of Health Building
Helena, MT 59601

W. M. Johns, Chief Geologist
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Dale Fredlund, State Archaeologist
University of Montana
Missoula, MT 59801

Sierra Club, Montana Group
c/o Mrs. Jane Calcaterra, Chairman
Box 315
Missoula, MT 59801

Ted Schwenden
State Dept. of Lands
Helena, MT 59601

Montana Wildlife Federation
c/o Don Aldrich, Exec. Sec.
410 Woodworth
Missoula, MT 59801

Environmental Quality Council
Capitol Station
Helena, MT 59601

Wes Woodgerd, Director
Montana Fish and Game Dept.
Helena, MT 59601

The Honorable John Melcher
House of Representatives
Washington, DC 20515

The Honorable Mike Mansfield
U. S. Senate Office Bldg.
Washington, DC 20510

The Honorable Lee Metcalf
U. S. Senate Office Bldg.
Washington, DC 20510

Montana Dept. of Planning & Ec. Devpmt.
1716 9th Ave.
Helena, MT 59601

Montana Power Co.
General Offices, Electric Bldg.
Butte, MT 59701

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Box 844
Billings, MT 59103

Solicitor's Office
Rich Aldrich
P. O. Box 1538
Billings, MT 59103

Grace Edwards
League of Women Voters
140 S. Crestwood
Billings, MT 59102

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Earth Science Dept.
Montana State University
Bozeman, MT 59715

Charles Linberg
Office Geologist
Resource Development Dept.
Burlington Northern
176 East 5th St.
St. Paul, MN 55101

D. H. Siewert, Exec. VP
Montana Chamber of Commerce
P. O. Box 1730
Helena, MT 59601

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Donald R. Holtz, Chief
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Donald E. Williams, Chief
Water Quality Bureau
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District Manager, BLM
Box 4227
Missoula, MT 59801

District Manager, BLM
P. O. Box B
Malta, MT 59538

District Manager, BLM
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Lewistown, MT 59457

District Manager, BLM
P. O. Box 940
West of Miles City
Miles City, MT 59301

Board of County Commissioners
Park County
Livingston, MT 59047

Board of County Commissioners
Sweet Grass County
Big Timber, MT 59011

Supervisor
Gallatin National Forest
Bozeman, MT 59715

Billings Gazette
Box 2507
Billings, MT 59103

The Chronicle
Bozeman, MT 59715

Dan MacIntyre
Supervisor
Custer National Forest
Box 2556
Billings, MT 59103

Livingston Enterprise
Livingston, MT 59047

Big Timber Pioneer
Big Timber, MT 59011

Park County News
Livingston, MT 59047

KULR TV
Box 2512
Billings, MT 59103

KXLF TV
Box 3500
Butte, MT 59701

The Great Falls Tribune
Great Falls, MT 59401

Montana Standard
Butte, MT 59701

The Tribune
Dillon, MT 59725

KTVQ TV
Box 2557
Billings, MT 59103

KFBB TV
Box 1139
Great Falls, MT 59401

Radio Station KXLF
P. O. Box 1956
Butte, MT 59701

Radio Station KDBM
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Dillon, MT 59725

Radio Station KANA
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Anaconda, MT 59711

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XI. INTENSITY OF PUBLIC INTEREST

On April 29, 1975, a letter from the District Manager and a copy of the proposed action were sent to local, state, and federal agencies, and public individuals and groups thought to be interested. The letter stated that a copy of the draft Environmental Analysis Record would be available for review at the District Office. (Appendix II) To date two public individuals have come to this office for the purpose of reviewing the draft EAR.

Special interest groups and state and federal agencies have expressed most concern and have submitted timely and useful comments on the proposed action. These replies are contained in Appendix V with comments on the replies attached.

XII. PARTICIPATING STAFF

The Environmental Analysis Report was prepared in the Billings District Office, and Montana State Office, Bureau of Land Management by:

John Bowers	Natural Resource Specialist
Holden Brink	Wildlife Management Biologist
David Fredley	Geologist
Roy Lembke	Natural Resource Specialist
John Mohr	Wildlife Management Biologist
Sherman Sollid	Geologist
Dan Stark	Lands and Minerals Specialist
Keith Thurlkill	Outdoor Recreation Planner
William Vincent	Archaeological Technician

XIII. SUMMARY CONCLUSION

From the above environmental analysis there are several points which can be concluded. Under the proposed action the negative environmental impacts to be expected are not significantly greater than those that would be expected under the "Decline to Lease," or Postpone Leasing" alternatives. There are no significant values identified which are unique to a specific tract such that the lease should be modified to avoid an impact. It is felt that adequate mitigating measures can be employed to significantly lessen impact to the tracts.

There are impacts which could occur on the lease tracts which would reduce or eliminate certain values and resources during the short-term. These include wildlife habitat, aesthetics, recreation, soils, and air quality. These resources and values can be recovered during the long-term.

It can also be concluded that the irretrievable commitments of resources is significantly less in the production and use of geothermal energy than in the use of coal, oil or natural gas.

XIV. REFERENCES

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Crazy Mountains Basin, 1972: Montana Geological Society Guidebook, 21st Annual Field Conference.

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APPENDIX

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APPENDIX I

APPENDIX #1

Archaeological Resources

The National Environmental Policy Act (83 Stat. 852), the National Historic Preservation Act (80 Stat. 915), and Executive Order 11593 require that federal agencies shall expend all efforts to insure the inventory and preservation of cultural resources on lands under federal ownership or jurisdiction.

The lessee will be required to complete certain qualified archaeological work as determined by the results of archaeological reports covering the leased area. The criteria and determination of the reports are as follows:

I. All archaeological resource inventory and evaluation work accomplished in conjunction with lands to be disturbed within this lease will be conducted and reported by a qualified cultural resource professional (CRP) as approved by the appropriate BLM officer, or a BLM archaeologist.

II. The lessee will be required to accept and carry out the recommended mitigating measures as presented in the archaeological reports or accept and carry out BLM approved alternatives.

III. The lessee will be required to carry out the following requirements (inventory and reports) prior to any actual on-the-ground surface disturbing activities.

A. Action Class I - Archaeological Inventory and Report

Prior to any actual on-the-ground surface disturbance, the lessee or BLM will be required to complete an archaeological inventory 1/ consisting of a presentation and summation of the data presently known concerning the lands to be disturbed within the leased area. An Action Class I case report shall be submitted by the CRP or BLM to the lessee and BLM. This report will contain a cultural resource map 2/, and describe the known cultural resources, the potential impact upon them and recommending mitigating procedures. In cases where there is not enough known archaeological data available, the

1/ See attached "Basic Terms Defined"

2/ See attached archaeological significance standards

CRP or BLM will be required to accomplish the necessary field work to collect and report as stated for the Class I report.

The BLM will complete this Action Class I Inventory and Report if manpower and time are available. If, however, the lessee desires to initiate surface disturbing activities on the leased area before the BLM completes the report, he may submit the qualified archaeological work to the BLM.

1. Lessee may plan to limit their surface disturbing activities to the areas of low (archaeological) significance S3[3/].

2. Providing the lessee must proceed with surface disturbing activities in areas determined as a mid-significant S2 site he must then proceed to an Action Class II report. Sites determined as high significance S1 will not be entered or disturbed until appropriate National Register actions are accomplished and approved.

B. Action Class II - Intensive Archaeological Reconnaissance Survey and Report

The CRP must complete an intensive archaeological reconnaissance survey on the intended disturbed area of the lease. The survey area will include, as a minimum, the proposed area to be disturbed as required for the given proposed activity, plus a one-eighth mile buffer zone around the area. However, the on-the-ground survey must cover an area of sufficient size to permit a determination of the archaeological resources present. Action Class II may include excavation work as needed. A Class II case report shall be submitted by the CRP to the lessee and BLM covering the areas of the lease that is proposed for the on-going surface disturbing activities. This report will contain number and extent of the Archaeological resources present, their scientific importance, time factors and the cost of preserving them or otherwise mitigating any adverse effects on them.

From the Class II survey and report certain archaeological factors will evolve that may point out specific sites that are more archaeologically significant than others. Should the lessee still wish to proceed in areas of mid-significance the Class II report, with BLM concurrence, will require the lessee to proceed with a Class III assessment report.

3/ Levels of archaeological significance

C. Action Class III - Archaeological Assessment

The CRP will use the acquired detailed information and make a report to the lessee and BLM stating the archaeological resources present in the area, their scientific significance, and the cost of protecting or properly investigating them.

Providing the lessee still wants to perform surface disturbing activities within any of the mid-significant archaeological areas, he will then have to proceed to Action Class IV excavation, collection, and site reports. For the areas or parts thereof as defined and mitigated in the Class III report and approved by the appropriate BLM Officer.

D. Action Clas IV - Excavation, Collection, and Specific Site Reports

Archaeological excavation: The scientifically controlled recovery or salvage of a site designed to yield maximum information about the life of the inhabitants, their ways of solving human problems, and of adjusting to and modifying their natural environment.

The CRP will furnish the lessee and BLM with copies of all archaeological reports, field notes, all artifacts, etc., will be turned over to the appropriate BLM official or their approved designee in concurrence with the appropriate acts and executive orders.

Three Levels of Archaeological Significance

A. High Significance (S1): A cultural resource that meets the criteria for the National Register. Any S1 cultural resource must ultimately be listed on the National Register.

B. Mid-Significance (S2): A cultural resource that has significant scientific, educational, and recreational value but that does not meet the criteria for the National Register. S2 cultural resources should be considered potential S1 properties as new information and techniques may change earlier evalutions.

C. Low Significance (S3): A cultural resource which does not meet the criteria for the National Register and which possesses little or no scientific, educational, or recreational value.

Some Basic Terms Defined

Archaeology: The scientific discipline responsible for recovering, analyzing, and interpreting the unwritten portion of man's historic and prehistoric past, thus contributing to our understanding of the present and to out ability to prepare for the future.

Archaeological Resources: Objects and areas made or modified by man and the data associated with these artifacts and features. These resources rest in or on the ground. Any alteration of the land surface destroys the associated information and endangers the artifacts themselves.

Archaeological Inventory: A presentation and summation of the data presently known concerning an area. This is called by some agencies a records-check. Only in very rare instances is present information sufficient to assess adequately the archaeological resources or to estimate the cost of mitigating the impact of a proposed project on those resources.

Preliminary Archaeological Reconnaissance: An on-the-ground surface examination of selected portions of the area to be affected, adequate to assess the general nature of the archaeological resources probably present and assess the probable impact of a project and to estimate the cost of mitigating that impact. This level of investigation is appropriate to preliminary planning decisions.

Intensive Archaeological Reconnaissance: An on-the-ground surface survey and testing of an area sufficient to permit determination of the number and extent of the resources present, their scientific importance, and the time factors and cost of preserving them or otherwise mitigating any adverse affects on them. This level of investigation is most appropriate once a specific region or area to be affected has been determined or the choice has been narrowed to one of a few prime locations.

Archaeological Assessment: An evaluation of the archaeological resources present in an area, their scientific significance, and the cost of protecting or properly investigating them.

Archaeological Excavation: The scientifically controlled recovery or salvage of a site designed to yield maximum information about the life of the inhabitants, their ways of solving human problems, and of adjusting to and modifying their natural environment. Such work should be programmed during final planning stages or at least during the early stages of project construction.

APPENDIX II

IN REPLY REFER TO

3200

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Billings District Office
P. O. Box 2020
Billings, Montana 59103

APR 29 1975

The Billings Bureau of Land Management District Office has received an application to lease federal geothermal resources for the purpose of exploration and possible geothermal development. The proposed lease area is approximately 18 miles northeast of Livingston, Montana, in the vicinity of Springdale.

Total available lease land involved in the lease application is 440.0 acres. This is apparently a minor acreage as geothermal resources have been leased on surrounding lands under private ownership by the applicant and others. An additional area containing 319.77 acres has been suspended from the application pending court determination of ownership of geothermal resources.

A discussion of Geothermal Energy with a description of the proposed action is enclosed for your information. A draft Environmental Analysis report has been prepared for the proposed action. A copy of this Analysis is at the District Office and is available for examination.

Please send your comments to the District Manager, Bureau of Land Management, Box 2020, Billings, MT 59103 on or before May 12, 1975.

Based upon the Analysis report and considering comments received, recommendations will be made for this proposed action.

Sincerely yours,

C. Rex Cleary

C. Rex Cleary
District Manager

Enclosure

Geothermal Lease Application

Hunter's Hot Springs Area

I. INTRODUCTION

A. Nature of Geothermal Energy

The earth is a large reservoir of thermal energy (heat). Temperatures increase with depth at an average of 1°F. for every 100 feet. This is called the geothermal gradient. In some areas this gradient exceeds 10 to 1,000 times the average heat flow. These are the areas of interest for development of geothermal energy.

The heat source for these near-surface hot spots are thought to be either:

1. A deep seated magma (molten rock) from which the heat escapes via faults or
2. A shallow magma or magma chamber in areas of fairly recent volcanic activity (within the last few million years).

Groundwater is heated by these energy sources and rises toward the surface. In some places the hot water is trapped by overlying impermeable rocks. In others it reaches the surface through faults. Hot springs, fumaroles, mud pots, and geysers are the surface expression in such cases.

B. Geothermal Systems

Two types of geothermal systems are considered to have present commercial application:

1. Vapor-dominated systems (dry steam) are believed to contain both saturated steam and water in the reservoir. When a well is drilled, the decrease in pressure superheats and dries the steam. The steam may be used to drive a turbine directly. These systems are thought to be relatively rare.

2. Hot water systems are thought to result from a heat driven convection system which moves the heated water upward. The upwelling hot water often penetrates the surface as hot springs or geysers. When a well is drilled, a portion of the water flashes to steam and both steam and water come to the surface. The steam is used to drive a turbine and the hot water is discharged at the surface or reinjected into the ground.

Two other types of system exist which are not capable of sustaining a geothermal development with present-day technology. They are basically a hot dry rock system composed of impermeable rocks overlying a local heat source and a geopressured reservoir system consisting of highly porous sands saturated with hot brines under high pressure. Both systems present difficult technical and economical problems and development is still in the research stage.

C. U. S. Geothermal Development

The Geysers, in northern California, is the only commercially developed geothermal energy field in the United States, with the exception of local use for space heating in a number of places.

At the Geysers, five power generating plants operate on a vapor dominated geothermal system to produce 400 megawatts of electrical power. This is roughly equivalent of 2/3 the electrical power demand of the City of San Francisco. The ultimate capacity of the field, when fully developed, is estimated to be between 1,000 and 3,000 megawatts--sufficient power to satisfy the demands of the entire San Francisco Bay urban area.

The initial development at the Geysers was pioneered by Magma Power Company. Union Oil Company is the current operator.

Exploration has been going on for the last 15 years or so in many localities in the western States. Technical development problems and the economics of alternate fuel sources have thus far delayed commercial power development.

D. Montana Geothermal

40 major hot springs have been identified in Montana and certainly many more small ones exist. Other areas, such as Marysville, have been identified where the geothermal

gradient is exceptionally high and yet no surface manifestation is present. These have been identified primarily by thermal measurements in old mineral exploration drill holes. Other methods are now being used for exploration and will be discussed in a later section.

The U. S. Geological Survey is currently identifying Known Geothermal Resource Areas (KGRA) in Montana. These are areas of known geothermal potential and will be offered as a competitive lease sale.

The only active drilling program in the State has been at the Marysville Geothermal Area near Helena. Here a deep exploration hole was drilled to 6,790 feet. This was a joint effort sponsored by the National Science Foundation and was strictly a research type of investigation.

Other activities in Montana include mostly water sampling, seismic surveys, land acquisition, and miscellaneous geological investigations. There has been a marked increase in these activities in the past few years.

II. DESCRIPTION OF THE PROPOSED ACTION:

A. Lands Involved

The proposed action involves leasing Federal geothermal resources for the purposes of exploration and possible geothermal development. All lands involved in the lease

application are subject to the terms of the Geothermal Steam Act of 1970.

The proposal involves an application for a noncompetitive lease on the following lands:

Private surface - Federal minerals

T. 1 S., R. 12 E., P.M.M.

Sec. 22: S½SE¼, NE¼SE¼

T. 2 S., R. 12 E.

Sec. 4: Lots 1, 2, and 3, S½NE¼ 319.77 acres

Federal Surface - Federal minerals

T. 1 S., R. 12 E., P.M.M.

Sec. 20: N½N½, SE¼NW¼
Sec. 24: NE¼NW¼, S½NW¼, N½SW¼, SW¼SW¼
440.00 acres

Total land involved in the lease application is 759.77 acres. This is apparently a minor acreage as geothermal resources have been leased on surrounding lands under private ownership.

B. Geothermal Development

1. States of Implementation

Basically, 4 separate stages of implementation have been identified in geothermal development:

a. Exploration (including test drilling)

b. Development

c. Operation

d. Close out

The progression from one step is dependent upon the success of earlier stage. Actually, one stage often blends into another and it would be common for exploration and development to be undertaken in one area of a geothermal field while production was going on in another area.

2. Exploration

Exploration includes all activities from the decision to explore for a geothermal area through the actual drilling of one or more exploratory wells.

All exploration activities are covered by a competitive or a non-competitive lease. Any surface disturbing activities up to and including the drilling of shallow temperature gradient holes can be conducted under an approved "Notice of Intent to Conduct Geothermal Resource Exploration Operations (Form 3200-9) before any lease has been issued.

Exploration, as related to surface damage, may be classified into four discrete operations, four of which require physical occupation of the surface involved. They are:

a. Airborne exploration

b. Off-road vehicular travel

c. Road and Trail construction

d. Drilling

Actually, a number of these activities may be going on simultaneously. A large area is covered first, gradually reducing the size until a target drilling site is located.

A. Airborne Exploration

Airborne methods seek to gain an understanding of the subsurface geology. They include:

1) Aerial photography--for geologic interpretation

2) Imagery--infrared and microwave for heat and soil moisture differentials

3) Magnetic--variations in earth's magnetic intensity

Airborne exploration produces no surface disturbance.

B. Off-road Vehicular Travel

Many exploration activities require off-road travel although existing roads are used where possible.

Cross-country travel is required in the following:

1) Geological mapping where one or more small vehicles are used.

2) Geophysical exploration ranging from one small truck to 5-7 trucks may be utilized. Often

surface mineral matter and vegetation must be removed from small areas for shot points or receiving sites.

3) Geochemical surveys including water sampling and soil or rock sampling on a grid system is often used. Small trucks are usually used to transport crews.

C. Road and Tract Construction

For exploration activities utilizing large equipment in rough terrain, it is often necessary to construct roads. Since they are generally for limited use, they are constructed to low standards.

D. Drilling

Several types of drilling may be utilized during the exploration stage.

1) Seismic test holes and temperature gradient holes are drilled with small truck-mounted rigs. The holes are generally between 4 and 6 inches in diameter. An area about 30 x 30 feet is disturbed by use of the drill rig and the servicing water truck.

2) Holes drilled for geological interpretations may extend to 1,000 feet, requiring larger equipment. Often a mud pit is needed and it typically may be 30-50 feet long, 10-20 feet wide, and 3-6 feet

deep, depending on the terrain. A total surface area 100 x 100 feet may be disturbed.

3) Exploration wells may be drilled to a total depth of 5,000 to 10,000 feet and are the same wells as those used for development and production. If successful, they are often converted to production.

A drill pad is leveled and cleared of vegetation. This could include a surface area from less than one acre up to two acres. A reserve pit ranging from 1,000 to 10,000 square feet and 6-8 feet deep may be dug to contain waste fluids and drill cuttings.

The well is cemented and cased and a blow-out preventer is installed to control sudden surges of pressure.

Blowouts are uncommon but do occur. Lack of knowledge of the geothermal field characteristics is the basic problem. During a blowout, water, steam, and contained elements are wasted and spread on the surrounding surface. Geothermal blowouts cause no fire hazard and are generally controlled by slant drilling and sealing with concrete.

The release of pressure and water through drill holes may affect the surface expression of the geothermal field. Springs and geysers may dry up, may increase in volume, or may relocate. Predictions of drilling results cannot be accurately made.

3. Development

Development includes all activities from the decision to develop a producing field until commercial power generation and transmission is reached. These operations are conducted only under a geothermal lease (either competitive or non-competitive).

Five discrete operations, as they relate to surface disturbance, are recognized:

a. Road development
b. Drill site development
c. Geothermal pipelines
d. Plant construction
e. Transmission lines

Many of these operations would normally be taking place concurrently.

A. Road Development

During development, roads to drill sites, power plant sites, and along transmission line routes may be constructed. Roads to producing wells and power plants

will be permanent and may be surfaced and stabilized. Temporary roads to drill sites and for construction of power lines will generally be built to a low standard.

B. Drill Site Development

Wells drilled during the development stage will be similar to exploration wells. Often, somewhat larger equipment is used. The drill pad is leveled and cleared of vegetation. Generally from less than one up to two acres are disturbed. A reserve pit (sump) 1,000 to 10,000 square feet and 6-8 feet deep is sometimes dug to contain waste fluids during the drilling operations.

1) Water - up to 50,000 gallons of water per day may be used in drilling a well. Water may come from shallow wells drilled in the immediate area or from surface water.
2) Spacing - more than one well is needed to service a geothermal plant. Due to heat loss, wells generally are placed within one-half mile of the plant. Generally, 16 to 20 wells are used per power plant.
3) Production Testing - each new well is vented to the atmosphere for a period of time to determine flow characteristics and to clean out the hole.

Steam, water, and noise accompany production testing. The water is generally caught in the reserve pit and contained while the steam is released to the air.

Noncondensable gases and vapors are often contained in the steam. When present in excessive amounts, some of these gases and vapors can be toxic. Monitoring devices and special safety precautions may be necessary as a safety measure.

Small amounts of hydrogen sulfide may also be present and the "rotten egg" odor can be an aesthetic problem.

Very high noises accompany production testing which require installation of muffling devices. Tests show that a muffled testing well has a noise level slightly less than that of an unmuffled diesel truck.

4) Blowouts - Studies show that blowouts have occurred in approximately 1-3% of all geothermal wells that have been drilled. None have resulted in any significant or lasting environmental damage.

C. Geothermal Pipelines

Pipelines 10 to 30 inches in diameter are used to transmit steam or hot water from the production wells to

the power plants. The pipes are typically insulated with fiberglass or asbestos to minimize heat loss. Expansion loops or joints are placed at frequent intervals either vertically or horizontally to provide for the extreme expansion and contraction of the pipes upon production startup (heating up) and shutdown (cooling down).

Under present technology, pipelines are constructed above ground to provide for expansion and contraction and to enhance maintenance and detection of leaks. Underground installation is thus far uneconomical and may also present some safety hazards.

The lines form a radiating pattern on the surface, connecting wells with the power plant. They may be painted to blend with the surroundings.

D. Plant Construction

Generating plants are centrally located to minimize the length of the steam or water pipes from the servicing wells. The largest plants in current use consist of two 55 MW generators housed together so that production is 110 MW per power plant. Power plant spacing is about one plant per 640 acres throughout the productive area.

At the Geysers, in California, the average 110 MW plant building is about 100 x 200 feet and three stories high. The adjacent cooling towers are about a third larger than the generating plant building. the entire generating plant-cooling tower complex occupies an area of about five acres.

E. Transmission Lines

Power generated from the plant is transmitted via conventional power lines to the area of use. The size and location of the lines is dependent upon the power output and destination.

The lines will tend to be large, considering that 1 MW of plant capacity will service the power needs of about 1,000 people. To express this another way, one 110 MW power plant could supply the power needs of the City of Billings.

4. Operation

The operation phase starts upon reaching commercial power production. Exploration and development are typically carried on in other parts of the geothermal field simultaneously with the operational activities.

The operation stage may be divided into the following discrete operations:

a. New drill sites

b. Maintenance

c. Waste disposal

d. Production

A. New Drill Sites

Geothermal fields are long lived resources. The Geysers is estimated to have a minimum productive life of 30 more years. Nonetheless, production slowly diminishes the heat flow and additional wells must be drilled and completed to keep the generating plant operating at full capacity.

Additional wells may also be required to replace wells that have become inoperative and, if the waste waters are disposed of by injection, injection wells may be drilled.

The technique and effect of these wells would be the same as for development wells. On a major producing field, it can be expected that one or two drilling rigs would be operating continuously throughout the life of the field drilling additional or replacement wells.

B. Maintenance

Repair, maintenance and monitoring of an operating field will require the periodic use of access roads

to service the equipment. Existing wells will require occasional repair work or cleanout. The amount of this remedial work will depend upon the production characteristics of the field; severe scaling and corrosion would require frequent remedial work. Normally, one medium-sized drill rig would be required full-time for each 20-30 wells (one 110 MW power plant).

C. Waste Disposal

The work force (both construction and maintenance) for geothermal power plants will usually be housed in the nearest town rather than creating a new town at the site. Thus, waste materials connected with human habitation will typically be handled in the local community.

At the plant site itself, sanitary facilities for workers are provided. Solid wastes are either disposed of in a dump developed at the site or trucked to the nearest established dump site.

The most significant waste disposal problem relates to handling the excess geothermal fluid. Disposal techniques vary, depending on the quality and quantities involved. Any or a combination of the following techniques may be employed:

1) Evaporation ponds - Where water quality is satisfactory,

such ponds may provide new aquatic habitat. Where water quality is toxic, special measures may be required to protect the ground water supply, livestock and wildlife.

2) Natural drainage systems - High quality water disposed of in this manner provides additional resources for agriculture, wildlife and other uses. Low quality water may require extensive treatment before it is suitable for release into natural drainages.

3) By-product development - In some instances it may be economical to extract useful minerals or gases from the geothermal fluids. This could result in increasing the waste water quality so as to make it available for other purposes. Desalinization may also be feasible in some areas, providing by-product fresh water for other uses.

4) Reinjection - At the Geysers, excess water is re-injected into nonproductive zones of the geothermal field. Successful reinjection is dependent on the quality of the waste water and the geologic characteristics of the geothermal field. Typical considerations would include: whether plugging and scaling problems will prevent the reservoir from accepting the fluid; whether fresh water aquifers can be adequately protected from contamination by hot saline waste water; and whether the subsurface rock structure will adequately hold the reinjected fluids.

D. Production

Production from a geothermal field generally requires 2-5 people per plant to inspect, adjust and service the wells, making the rounds about once each day on the existing road network.

Sustained production may have several effects:

1) Temperature drop - The field will gradually realize diminishing temperatures as the energy is utilized.
2) Water utilization - Cooling towers will consume about 40-45 acre feet of water per year for each megawatt of plant capacity. The water may come either from steam condensate, waste geothermal water, or from any other water source. This water consumption might be reduced by use of some technique other than conventional cooling towers. One such scheme, called the "night stream cooling system" would theoretically use only 42% as much water.
3) Subsidence - As large volumes of water are pumped from a geothermal reservoir, some subsidence of the ground surface may occur. In many cases subsidence may have no serious land use or environmental consequences. In some situations, such as developed agricultural land under gravity irrigation, minor surface subsidence could have a significant impact. Continuous monitoring might be necessary to detect

whether subsidence was occurring. In some instances, reinjection of the waste water might correct subsidence problems.

4) Seismic activity - Geothermal areas are typically associated with seismic activity. Such activity is generally of small magnitude (usually less than 4.5 on the Richter scale). Fluid pressure changes from both production and reinjection may tend to increase earthquake frequency, though the relationship is not well known. To date, such earthquakes have been small and there is some evidence to suggest that this minor seismic activity tends to relieve regional stresses and diminishes the likelihood of large earthquakes. Earthquakes sometimes modify geyser activity and may effect other geothermal features such as hot springs.

5. Close-Out

Close-out or final abandonment takes place when energy production ceases to be economic. To date, no developed geothermal field has reached this stage. In a sense, geothermal reservoirs may be somewhat renewable resources in that after a long period of rest, the fluids may become reheated to temperatures that are again useable.

Two discrete operations are expected to take place during close-out:

a. Removal of improvements

b. Restoration of surface

A. Removal of Improvements

The removal of improvements from a geothermal field involves:

1) Surface improvements - Removal of all structures constructed during field development and operations will be accomplished. Solid waste remaining may either be disposed of in a dump developed at the site or trucked to the nearest established dump.

2) Wells - The bottom of the hole is plugged with cement and the surface casing is also plugged with about 20 feet of cement. The casing is cut off below the surface and a steel plate welded over the hole. A vertical steel pipe and marker is welded to the plate. The concrete lined excavation surrounding the hole (called the "cellar") is pushed in and the location may be graded and revegetated. The marker remains above ground to provide identification.

3) Transmission lines - Any of the electrical transmission lines no longer in use will be removed.

B. Restoration of the Surface

Surface restoration will typically be a gradual process, taking place throughout the life of the field and

culminating with the final abandonment. Access roads can be ripped up, landscaped and revegetated. Well and plant locations can similarly be treated but, because of their larger size, complete landscaping to approximate the original surface in steep terrain will not be feasible except in unusual circumstances.

C. Model of Geothermal Field-Power Plant Development

To develop a simulated model for Montana geothermal development, it is necessary to analyze the Geyser's geothermal area in California.

The Geyser's geothermal field is a vapor dominated (dry steam) system. Dry steam produced through wells is used to drive turbines and produce electricity.

At the Geysers, approximately 15 wells are required to provide steam for a 110 MW power plant. It was found that well spacing on less than a 20-acre grid resulted in less steam production per well due to the tapping of the same reservoir. This spacing allows an adequate number of wells within ½ mile of each power plant. One-half mile is the probable maximum distance for steam transport due to heat and pressure losses.

At the Geysers, a typical 110 MW plant requires

approximately 2,000,000 lbs. of steam per hour. Temperatures and pressures at the turbine are approximately 350°F and 100 psi, respectively. At 100 psi, water flashes to steam at 327°F.

The wells associated with the Geysers produce from 50,000 lbs. to 300,000 lbs. of steam per hour. Therefore, the average well will produce approximately 7½ MW. This indicates that 20,000 lbs. of steam per hour are required to produce 1 MW of power.

No vapor dominated systems are known to exist in Montana. There are good indications of hot water geothermal systems in several areas in Montana. The Hunter's Hot Springs area is one of these. In contrast to a vapor dominated system, only about 15 to 20% of the fluid produced in a hot water system will flash to steam when reservoir pressures are relieved by drilling into them. Based on steam porduction from wells in the Geysers in California and also from wells in Cerro Prieto, Mexico, it is estimated that a potential of about 60,000 - 70,000 lbs. of steam per hour (or 3 to 4 MW per wll) could be expected in a hot water system in Montana. Temperatures up to 580°F and pressures ranging from 50 to 150 psi have been reported in other areas where a hot water system occurs. Results of a geothermometry analysis of hot water at

Hunter's Hot Springs (USGS, 1975) indicates that minimum temperatures of around 179°F might be expected at depth. Surface temperatures of the Hot Springs are about 140°F.

With the hot water system, it seems reasonable to use ½ mile as a maximum distance for steam transportation. Therefore, a 110 MW power plant in Montana, considering a hot water system, 20 - acre well spacing, and piping steam up to ½ mile, would require about 30 wells. This indicates that nearly 640 acres would probably be required for a 110 MW geothermal plant in Montana. Actual surface disturbance probably would not exceed 20 - 25% of the area (see tables 1 and 2).

In order to identify the impacts associated with each operation of geothermal development, it is necessary to consider the number of surface acres disturbed. The following two tables indicate the approximate number of features that will be found on the ground and the number of surface acres that may be disturbed with each.

TABLE 1

Surface Disturbance Expected From Exploration Drilling

Per Lease Area (2560 Acres)

Feature	No. of Acres Disturbed	No. of Features	Acres Disturbed
Well	2	5	10
Disposal Pond	4	5	20
Access Roads	1.5	5	8
			38 Acres

The activities required to develop one 110 MW power plant are listed in the following table. The number of wells includes those used for production, standby, and reinjection.

TABLE 2

Surface Disturbance Expected From Development of One 110 MW Power Plant Complex (Montana)

Feature	No. of Acres Disturbed/Feature	No. of Features	Acres Disturbed
Power Plant	5	1	5
Well	2	± 32	64
Disposal Pond	4	10	40
Pipeline	1.2	-	30
Roads	13	-	35
Transmission Line	4.5	-	4.5
			178.5 Acres

There would also be geothermal fluids produced at each well during exploration testing and production operations. The fluid production rate from a geothermal reservoir would not be known until the production testing phase is completed. Data from other areas of geothermal development in hot water systems show that fluid rates vary from 440,000 - 900,000 gallons per day per well. At an average of 670,000 gallons per day per well, 30 producing wells would yield approximately 30 million gallons of fluid per day. This is significantly higher than fluid produced in a vapor dominated system such as the Geysers Area.

The exact nature of such geothermal fluids in Montana is unknown. It can be speculated that they may contain mineral by-products such as sodium, potassium, lithium, cesium, chloride, bicarbonate, sulfate, borate, and silicia. In addition, such toxic substances such as boron, arsenic, fluoride, zinc, etc., could be present in the fluids. Because of these components, it would be unlikely that the geothermal fluids would be allowed to escape to the surface or shallow subsurface areas. In addition, the possibility exists that certain noxious and/or toxic gases and vapors such as hydrogen sulfide, ammonia, mercury vapor, carbon monoxide, etc., could be introduced to the atmosphere from the steam component of the resource.

In some cases, these geothermal fluids may be relatively pure water or are capable of being purified. Reinjection wells would probably be used to dispose of unusable geothermal wastes.

APPENDIX III

APPENDIX III

Secretary's Regulations

1. Geothermal Steam Act

2. Title 30 - Mineral Resources
   Chapter II - Geological Survey, Department of the Interior

   a. Part 270 - Geothermal Resources Operations
      On Public, Acquired & Withdrawn Lands

   b. Part 271 - Geothermal Resources Unit Plan
      Regulations (Including Suggested Forms)

3. Title 43 - Public Lands
   Chapter II - Bureau of Land Mangement
   Department of the Interior
   Subchapter C - Minerals Management

   a. Part 3000 Minerals Management; General

   b. Part 3200 Geothermal Resources Leasing; General

4. Approved Geothermal Resources Operational Orders No. 1, 2, 3, and 4.

5. Bureau of Land Management Form 3200-9; Notice of Intent to Conduct Geothermal Resource Exploration Operations.

6. Bureau of Land Management Form 3200-21;
   Geothermal Resources Lease

Public Law 91-581
91st Congress, S. 368
December 24, 1970

An Act

To authorize the Secretary of the Interior to make disposition of geothermal steam and associated geothermal resources, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Geothermal Steam Act of 1970". Geothermal Steam Act of 1970.

SEC. 2. As used in this Act, the term— Definitions.

(a) "Secretary" means the Secretary of the Interior;

(b) "geothermal lease" means a lease issued under authority of this Act;

(c) "geothermal steam and associated geothermal resources" means (i) all products of geothermal processes, embracing indigenous steam, hot water and hot brines; (ii) steam and other gases, hot water and hot brines resulting from water, gas, or other fluids artificially introduced into geothermal formations; (iii) heat or other associated energy found in geothermal formations; and (iv) any byproduct derived from them;

(d) "byproduct" means any mineral or minerals (exclusive of oil, hydrocarbon gas, and helium) which are found in solution or in association with geothermal steam and which have a value of less than 75 per centum of the value of the geothermal steam or are not, because of quantity, quality, or technical difficulties in extraction and production, of sufficient value to warrant extraction and production by themselves;

(e) "known geothermal resources area" means an area in which the geology, nearby discoveries, competitive interests, or other indicia would, in the opinion of the Secretary, engender a belief in men who are experienced in the subject matter that the prospects for extraction of geothermal steam or associated geothermal resources are good enough to warrant expenditures of money for that purpose.

SEC. 3. Subject to the provisions of section 15 of this Act, the Secretary of the Interior may issue leases for the development and utilization of geothermal steam and associated geothermal resources (1) in lands administered by him, including public, withdrawn, and acquired lands, (2) in any national forest or other lands administered by the Department of Agriculture through the Forest Service, including public, withdrawn, and acquired lands, and (3) in lands which have been conveyed by the United States subject to a reservation to the United States of the geothermal steam and associated geothermal resources therein. Leases.

SEC. 4. If lands to be leased under this Act are within any known geothermal resources area, they shall be leased to the highest responsible qualified bidder by competitive bidding under regulations formulated by the Secretary. If the lands to be leased are not within any known geothermal resources area, the qualified person first making application for the lease shall be entitled to a lease of such lands without competitive bidding. Notwithstanding the foregoing, at any time within one hundred and eighty days following the effective date of this Act: Bids. Conversion.

(a) with respect to all lands which were on September 7, 1965, subject to valid leases or permits issued under the Mineral Leasing Act of February 25, 1920, as amended (30 U.S.C. 181 et seq.), or under the Mineral Leasing Act of Acquired Lands, as amended (30 U.S.C. 351, 358), or to existing mining claims located on or prior to September 7, 1965, the lessees or permittees or claimants or their successors in interest who are qualified to hold geothermal 41 Stat. 437. 61 Stat. 913.

leases shall have the right to convert such leases or permits or claims to geothermal leases covering the same lands;

(b) where there are conflicting claims, leases, or permits therefor embracing the same land, the person who first was issued a lease or permit, or who first recorded the mining claim shall be entitled to first consideration;

(c) with respect to all lands which were on September 7, 1965, the subject of applications for leases or permits under the above Acts, the applicants may convert their applications to applications for geothermal leases having priorities dating from the time of filing of such applications under such Acts;

Acreage limitation.

(d) no person shall be permitted to convert mineral leases, permits, applications therefor, or mining claims for more than 10,240 acres; and

(e) the conversion of leases, permits, and mining claims and applications for leases and permits shall be accomplished in accordance with regulations prescribed by the Secretary. No right to conversion to a geothermal lease shall accrue to any person under this section unless such person shows to the reasonable satisfaction of the Secretary that substantial expenditures for the exploration, development, or production of geothermal steam have been made by the applicant who is seeking conversion, on the lands for which a lease is sought or on adjoining, adjacent, or nearby Federal or non-Federal lands.

(f) with respect to lands within any known geothermal resources area and which are subject to a right to conversion to a geothermal lease, such lands shall be leased by competitive bidding: *Provided*. That, the competitive geothermal lease shall be issued to the person owning the right to conversion to a geothermal lease if he makes payment of an amount equal to the highest bona fide bid for the competitive geothermal lease, plus the rental for the first year, within thirty days after he receives written notice from the Secretary of the amount of the highest bid.

Lease provisions.

SEC. 5. Geothermal leases shall provide for—

Royalties.

(a) a royalty of not less than 10 per centum or more than 15 per centum of the amount or value of steam, or any other form of heat or energy derived from production under the lease and sold or utilized by the lessee or reasonably susceptible to sale or utilization by the lessee;

(b) a royalty of not more than 5 per centum of the value of any byproduct derived from production under the lease and sold or utilized or reasonably susceptible of sale or utilization by the lessee, except that as to any byproduct which is a mineral named in section 1 of the Mineral Leasing Act of February 25, 1920, as amended (30 U.S.C. 181), the rate of royalty for such mineral shall be the same as that provided in that Act and the maximum rate of royalty for such mineral shall not exceed the maximum royalty applicable under that Act;

41 Stat. 437.

Rent.

(c) payment in advance of an annual rental of not less than $1 per acre or fraction thereof for each year of the lease. If there is no well on the leased lands capable of producing geothermal resources in commercial quantities, the failure to pay rental on or before the anniversary date shall terminate the lease by operation of law: *Provided, however*, That whenever the Secretary discovers that the rental payment due under a lease is paid timely but the amount of the payment is deficient because of an error or other reason and the deficiency is nominal, as determined by the Secretary pursuant to regulations prescribed by him, he shall notify the lessee of the deficiency and such lease shall not automatically terminate unless

the lessee fails to pay the deficiency within the period prescribed in the notice: *Provided further*, That, where any lease has been terminated automatically by operation of law under this section for failure to pay rental timely and it is shown to the satisfaction of the Secretary of the Interior that the failure to pay timely the lease rental was justifiable or not due to a lack of reasonable diligence, he in his judgment may reinstate the lease if—

(1) a petition for reinstatement, together with the required rental, is filed with the Secretary of the Interior; and

(2) no valid lease has been issued affecting any of the lands in the terminated lease prior to the filing of the petition for reinstatement; and

(d) a minimum royalty of $2 per acre or fraction thereof in lieu of rental payable at the expiration of each lease year for each producing lease, commencing with the lease year beginning on or after the commencement of production in commercial quantities. For the purpose of determining royalties hereunder the value of any geothermal steam and byproduct used by the lessee and not sold and reasonably susceptible of sale shall be determined by the Secretary, who shall take into consideration the cost of exploration and production and the economic value of the resource in terms of its ultimate utilization.

Term.

SEC. 6. (a) Geothermal leases shall be for a primary term of ten years. If geothermal steam is produced or utilized in commercial quantities within this term, such lease shall continue for so long thereafter as geothermal steam is produced or utilized in commercial quantities, but such continuation shall not exceed an additional forty years.

Limitation.

Renewal.

(b) If, at the end of such forty years, steam is produced or utilized in commercial quantities and the lands are not needed for other purposes, the lessee shall have a preferential right to a renewal of such lease for a second forty-year term in accordance with such terms and conditions as the Secretary deems appropriate.

Extension.

(c) Any lease for land on which, or for which under an approved cooperative or unit plan of development or operation, actual drilling operations were commenced prior to the end of its primary term and are being diligently prosecuted at that time shall be extended for five years and so long thereafter, but not more than thirty-five years, as geothermal steam is produced or utilized in commercial quantities. If, at the end of such extended term, steam is being produced or utilized in commercial quantities and the lands are not needed for other purposes, the lessee shall have a preferential right to a renewal of such lease for a second term in accordance with such terms and conditions as the Secretary deems appropriate.

(d) For purposes of subsection (a) of this section, production or utilization of geothermal steam in commercial quantities shall be deemed to include the completion of one or more wells producing or capable of producing geothermal steam in commercial quantities and a bona fide sale of such geothermal steam for delivery to or utilization by a facility or facilities not yet installed but scheduled for installation not later than fifteen years from the date of commencement of the primary term of the lease.

(e) Leases which have extended by reasons of production, or which have produced geothermal steam, and have been determined by the Secretary to be incapable of further commercial production and utilization of geothermal steam may be further extended for a period of not more than five years from the date of such determination but only for so long as one or more valuable byproducts are produced in commercial quantities. If such byproducts are leasable under the Mineral Leasing Act of February 25, 1920, as amended (30 U.S.C. 181, et seq.), or under the Mineral Leasing Act for Acquired Lands (30 U.S.C.

41 Stat. 437.

61 Stat. 913. 351-358), and the leasehold is primarily valuable for the production thereof, the lessee shall be entitled to convert his geothermal lease to a mineral lease under, and subject to all the terms and conditions of, such appropriate Act upon application at any time before expiration of the lease extension by reason of byproduct production. The lessee shall be entitled to locate under the mining laws all minerals which are not leasable and which would constitute a byproduct if commercial production or utilization of geothermal steam continued. The lessee in order to acquire the rights herein granted him shall complete the location of mineral claims within ninety days after the termination of the lease for geothermal steam. Any such converted lease or the surface of any mining claim located for geothermal byproducts mineral affecting lands withdrawn or acquired in aid of a function of a Federal department or agency, including the Department of the Interior, shall be subject to such additional terms and conditions as may be prescribed by such department or agency with respect to the additional operations or effects resulting from such conversion upon adequate utilization of the lands for the purpose for which they are administered.

(f) Minerals locatable under the mining laws of the United States in lands subject to a geothermal lease issued under the provisions of this Act which are not associated with the geothermal steam and associated geothermal resources of such lands as defined in section 2(c) herein shall be locatable under said mining laws in accordance with the principles of the Multiple Mineral Development Act (68 Stat. 708; found in 30 U.S.C. 521 et seq.).

Leases, acreage. SEC. 7. A geothermal lease shall embrace a reasonably compact area of not more than two thousand five hundred and sixty acres, except where a departure therefrom is occasioned by an irregular subdivision or subdivisions.

Limitation. No person, association, or corporation, except as otherwise provided in this Act, shall take, hold, own, or control at one time, whether acquired directly from the Secretary under this Act or otherwise, any direct or indirect interest in Federal geothermal leases in any one State exceeding twenty thousand four hundred and eighty acres, including leases acquired under the provisions of section 4 of this Act.

Increase. At any time after fifteen years from the effective date of this Act the Secretary, after public hearings, may increase this maximum holding in any one State by regulation, not to exceed fifty-one thousand two hundred acres.

Readjustment. SEC. 8. (a) The Secretary may readjust the terms and conditions, except as otherwise provided herein, of any geothermal lease issued under this Act at not less than ten-year intervals beginning ten years after the date the geothermal steam is produced, as determined by the Secretary. Each geothermal lease issued under this Act shall provide for such readjustment.

Notice. The Secretary shall give notice of any proposed readjustment of terms and conditions, and, unless the lessee files with the Secretary objection to the proposed terms or relinquishes the lease within thirty days after receipt of such notice, the lessee shall conclusively be deemed to have agreed with such terms and conditions. If the lessee files objections, and no agreement can be reached between the Secretary and the lessee within a period of not less than sixty days, the lease may be terminated by either party.

(b) The Secretary may readjust the rentals and royalties of any geothermal lease issued under this Act at not less than twenty-year intervals beginning thirty-five years after the date geothermal steam is produced, as determined by the Secretary. In the event of any such readjustment neither the rental nor royalty may be increased by more than 50 per centum over the rental or royalty paid during the preceding period, and in no event shall the royalty payable exceed 22½ per centum. Each geothermal lease issue under this Act shall provide

for such readjustment. The Secretary shall give notice of any proposed readjustment of rentals and royalties, and, unless the lessee files with the Secretary objection to the proposed rentals and royalties or relinquishes the lease within thirty days after receipt of such notice, the lessee shall conclusively be deemed to have agreed with such terms and conditions. If the lessee files objections, and no agreement can be reached between the Secretary and the lessee within a period of not less than sixty days, the lease may be terminated by either party. Notice.

(c) Any readjustment of the terms and conditions as to use, protection, or restoration of the surface of any lease of lands withdrawn or acquired in aid of a function of a Federal department or agency other than the Department of the Interior may be made only upon notice to, and with the approval of, such department or agency.

Byproducts.

SEC. 9. If the production, use, or conversion of geothermal steam is susceptible of producing a valuable byproduct or byproducts, including commercially demineralized water for beneficial uses in accordance with applicable State water laws, the Secretary shall require substantial beneficial production or use thereof unless, in individual circumstances he modifies or waives this requirement in the interest of conservation of natural resources or for other reasons satisfactory to him. However, the production or use of such byproducts shall be subject to the rights of the holders of preexisting leases, claims, or permits covering the same land or the same minerals, if any.

Relinquishment.

SEC. 10. The holder of any geothermal lease at any time may make and file in the appropriate land office a written relinquishment of all rights under such lease or of any legal subdivision of the area covered by such lease. Such relinquishment shall be effective as of the date of its filing. Thereupon the lessee shall be released of all obligations thereafter accruing under said lease with respect to the lands relinquished, but no such relinquishment shall release such lessee, or his surety or bond, from any liability for breach of any obligation of the lease, other than an obligation to drill, accrued at the date of the relinquishment, or from the continued obligation, in accordance with the applicable lease terms and regulations, (1) to make payment of all accrued rentals and royalties, (2) to place all wells on the relinquished lands in condition for suspension or abandonment, and (3) to protect or restore substantially the surface and surface resources.

Suspension.

SEC. 11. The Secretary, upon application by the lessee, may authorize the lessee to suspend operations and production on a producing lease and he may, on his own motion, in the interest of conservation suspend operations on any lease but in either case he may extend the lease term for the period of any suspension, and he may waive, suspend, or reduce the rental or royalty required in such lease.

Leases, termination. Notice.

SEC. 12. Leases may be terminated by the Secretary for any violation of the regulations or lease terms after thirty days notice provided that such violation is not corrected within the notice period, or in the event the violation is such that it cannot be corrected within the notice period then provided that lessee has not commenced in good faith within said notice period to correct such violation and thereafter to proceed diligently to correct such violation. Lessee shall be entitled to a hearing on the matter of such claimed violation or proposed termination of lease if request for a hearing is made to the Secretary within the thirty-day period after notice. The period for correction of violation or commencement to correct such violation of regulations or of lease terms, as aforesaid, shall be extended to thirty days after the Secretary's decision after such hearing if the Secretary shall find that a violation exists.

SEC. 13. The Secretary may waive, suspend, or reduce the rental or royalty for any lease or portion thereof in the interests of conservation and to encourage the greatest ultimate recovery of geothermal

resources, if he determines that this is necessary to promote development or that the lease cannot be successfully operated under the lease terms.

Surface land, use.

SEC. 14. Subject to the other provisions of this Act, a lessee shall be entitled to use so much of the surface of the land covered by his geothermal lease as may be found by the Secretary to be necessary for the production, utilization, and conservation of geothermal resources.

SEC. 15. (a) Geothermal leases for lands withdrawn or acquired in aid of functions of the Department of the Interior may be issued only under such terms and conditions as the Secretary may prescribe to insure adequate utilization of the lands for the purposes for which they were withdrawn or acquired.

(b) Geothermal leases for lands withdrawn or acquired in aid of functions of the Department of Agriculture may be issued only with the consent of, and subject to such terms and conditions as may be prescribed by, the head of that Department to insure adequate utilization of the lands for the purposes for which they were withdrawn or acquired. Geothermal leases for lands to which section 24 of the Federal Power Act, as amended (16 U.S.C. 818), is applicable, may be issued only with the consent of, and subject to, such terms and conditions as the Federal Power Commission may prescribe to insure adequate utilization of such lands for power and related purposes.

41 Stat. 1075; 62 Stat. 275.

(c) Geothermal leases under this Act shall not be issued for lands administered in accordance with (1) the Act of August 25, 1916 (39 Stat. 535), as amended or supplemented, (2) for lands within a national recreation area, (3) for lands in a fish hatchery administered by the Secretary, wildlife refuge, wildlife range, game range, wildlife management area, waterfowl production area, or for lands acquired or reserved for the protection and conservation of fish and wildlife that are threatened with extinction, (4) for tribally or individually owned Indian trust or restricted lands, within or without the boundaries of Indian reservations.

16 USC 1.

Lessees, citizenship requirement.

SEC. 16. Leases under this Act may be issued only to citizens of the United States, associations of such citizens, corporations organized under the laws of the United States or of any State or the District of Columbia, or governmental units, including, without limitation, municipalities.

SEC. 17. Administration of this Act shall be under the principles of multiple use of lands and resources, and geothermal leases shall, insofar as feasible, allow for coexistence of other leases of the same lands for deposits of minerals under the laws applicable to them, for the location and production of claims under the mining laws, and for other uses of the areas covered by them. Operations under such other leases or for such other uses, however, shall not unreasonably interfere with or endanger operations under any lease issued pursuant to this Act, nor shall operations under leases so issued unreasonably interfere with or endanger operations under any lease, license, claim, or permit issued pursuant to the provisions of any other Act.

Cooperative or unit plan.

SEC. 18. For the purpose of properly conserving the natural resources of any geothermal pool, field, or like area, or any part thereof, lessees thereof and their representatives may unite with each other, or jointly or separately with others, in collectively adopting and operating under a cooperative or unit plan of development or operation of such pool, field, or like area, or any part thereof, whenever this is determined and certified by the Secretary to be necessary or advisable in the public interest. The Secretary may in his discretion and with the consent of the holders of leases involved, establish, alter, change, revoke, and make such regulations with reference to such leases in connection with the institution and operation of any such cooperative or unit plan as he may deem necessary or proper to secure reasonable protection of the

public interest. He may include in geothermal leases a provision requiring the lessee to operate under such a reasonable cooperative or unit plan, and he may prescribe such a plan under which such lessee shall operate, which shall adequately protect the rights of all parties in interest, including the United States. Any such plan may, in the discretion of the Secretary, provide for vesting in the Secretary or any other person, committee, or Federal or State agency designated therein, authority to alter or modify from time to time the rate of prospecting and development and the quantity and rate of production under such plan. All leases operated under any such plan approved or prescribed by the Secretary shall be excepted in determining holdings or control for the purposes of section 7 of this Act.

When separate tracts cannot be independently developed and operated in conformity with an established well-spacing or development program, any lease, or a portion thereof, may be pooled with other lands, whether or not owned by the United States, under a communitization or drilling agreement providing for an apportionment of production or royalties among the separate tracts of land comprising the drilling or spacing unit when determined by the Secretary to be in the public interest, and operations or production pursuant to such an agreement shall be deemed to be operations or production as to each lease committed thereto.

The Secretary is hereby authorized, on such conditions as he may prescribe, to approve operating, drilling, or development contracts made by one or more lessees of geothermal leases, with one or more persons, associations, or corporations whenever, in his discretion, the conservation of natural products or the public convenience or necessity may require or the interests of the United States may be best served thereby. All leases operated under such approved operating, drilling, or development contracts, and interests thereunder, shall be excepted in determining holdings or control under section 7 of this Act.

SEC. 19. Upon request of the Secretary, other Federal departments and agencies shall furnish him with any relevant data then in their possession or knowledge concerning or having bearing upon fair and adequate charges to be made for geothermal steam produced or to be produced for conversion to electric power or other purposes. Data given to any department or agency as confidential under law shall not be furnished in any fashion which identifies or tends to identify the business entity whose activities are the subject of such data or the person or persons who furnished such information.

SEC. 20. All moneys received under this Act from public lands under the jurisdiction of the Secretary shall be disposed of in the same manner as moneys received from the sale of public lands. Moneys received under this Act from other lands shall be disposed of in the same manner as other receipts from such lands. Moneys.

SEC. 21. (a) Within one hundred and twenty days after the effective date of this Act, the Secretary shall cause to be published in the Federal Register a determination of all lands which were included within any known geothermal resources area on the effective date of the Act. He shall likewise publish in the Federal Register from time to time his determination of other known geothermal resources areas specifying in each case the date the lands were included in such area; and Publication in Federal Register.

(b) Geothermal resources in lands the surface of which has passed from Federal ownership but in which the minerals have been reserved to the United States shall not be developed or produced except under geothermal leases made pursuant to this Act. If the Secretary of the Interior finds that such development is imminent, or that production from a well heretofore drilled on such lands is imminent, he shall so report to the Attorney General, and the Attorney General is authorized

and directed to institute an appropriate proceeding in the United States district court of the district in which such lands are located, to quiet the title of the United States in such resources, and if the court determines that the reservation of minerals to the United States in the lands involved included the geothermal resources, to enjoin their production otherwise than under the terms of this Act: *Provided*, That upon an authoritative judicial determination that Federal mineral reservation does not include geothermal steam and associated geothermal resources the duties of the Secretary of the Interior to report and of the Attorney General to institute proceedings, as hereinbefore set forth, shall cease.

SEC. 22. Nothing in this Act shall constitute an express or implied claim or denial on the part of the Federal Government as to its exemption from State water laws.

Waste, prevention.

SEC. 23. (a) All leases under this Act shall be subject to the condition that the lessee will, in conducting his exploration, development, and producing operations, use all reasonable precautions to prevent waste of geothermal steam and associated geothermal resources developed in the lands leased.

(b) Rights to develop and utilize geothermal steam and associated geothermal resources underlying lands owned by the United States may be acquired solely in accordance with the provisions of this Act.

Rules and regulations.

SEC. 24. The Secretary shall prescribe such rules and regulations as he may deem appropriate to carry out the provisions of this Act. Such regulations may include, without limitation, provisions for (a) the prevention of waste, (b) development and conservation of geothermal and other natural resources, (c) the protection of the public interest, (d) assignment, segregation, extension of terms, relinquishment of leases, development contracts, unitization, pooling, and drilling agreements, (e) compensatory royalty agreements, suspension of operations or production, and suspension or reduction of rentals or royalties, (f) the filing of surety bonds to assure compliance with the terms of the lease and to protect surface use and resources, (g) use of the surface by a lessee of the lands embraced in his lease, (h) the maintenance by the lessee of an active development program, and (i) protection of water quality and other environmental qualities.

SEC. 25. As to any land subject to geothermal leasing under section 3 of this Act, all laws which either (a) provide for the disposal of land by patent or other form of conveyance or by grant or by operation of law subject to a reservation of any mineral or (b) prevent or restrict the disposal of such land because of the mineral character of the land, shall hereafter be deemed to embrace geothermal steam and associated geothermal resources as a substance which either must be reserved or must prevent or restrict the disposal of such land, as the case may be. This section shall not be construed to affect grants, patents, or other forms of conveyances made prior to the date of enactment of this Act.

SEC. 26. The first two clauses in section 11 of the Act of August 13, 1954 (68 Stat. 708, 716), are amended to read as follows:

30 USC 530.

"As used in this Act, 'mineral leasing laws' shall mean the Act of February 25, 1920 (41 Stat. 437); the Act of April 17, 1926 (44 Stat. 301); the Act of February 7, 1927 (44 Stat. 1057); Geothermal Steam Act of 1970, and all Acts heretofore or hereafter enacted which are amendatory of or supplementary to any of the foregoing Acts; 'Leasing Act minerals' shall mean all minerals which, upon the effective date of this Act, are provided in the mineral leasing laws to be disposed of thereunder and all geothermal steam and associated geothermal resources which, upon the effective date of the Geothermal Steam Act of 1970, are provided in that Act to be disposed of thereunder;".

30 USC 181.
30 USC 281.

Certain mineral rights, retention by U. S.

SEC. 27. The United States reserves the ownership of and the right to extract under such rules and regulations as the Secretary may prescribe oil, hydrocarbon gas, and helium from all geothermal steam and associated geothermal resources produced from lands leased under this Act in accordance with presently applicable laws: *Provided*, That whenever the right to extract oil, hydrocarbon gas, and helium from geothermal steam and associated geothermal resources produced from such lands is exercised pursuant to this section, it shall be exercised so as to cause no substantial interference with the production of geothermal steam and associated geothermal resources from such lands.

Approved December 24, 1970.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 91-1544 (Comm. on Interior and Insular Affairs).
SENATE REPORT No. 91-1160 (Comm. on Interior and Insular Affairs).
CONGRESSIONAL RECORD, Vol. 116 (1970):
Sept. 16, Oct. 14, Dec. 4, 10, considered and passed Senate.
Oct. 5, Dec. 9, considered and passed House.

Title 30—Mineral Resources

CHAPTER II—GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

PART 270—GEOTHERMAL RESOURCES OPERATIONS ON PUBLIC, ACQUIRED, AND WITHDRAWN LANDS

PART 271—GEOTHERMAL RESOURCES UNIT PLAN REGULATIONS (INCLUDING SUGGESTED FORMS)

The purpose of these regulations is to implement the Geothermal Steam Act of 1970 (30 U.S.C. 1001–1025) and provide for the leasing of the public and acquired lands of the United States for the purpose of geothermal resources exploration, development, and production.

The public was afforded an opportunity to comment on proposed rulemaking published on July 23, 1971, November 29, 1972, and July 23, 1973 and supplemented on August 8, 1973. These regulations reflect consideration of all comments received on the published proposed rulemaking.

A Final Environmental Statement, prepared in accordance with the provisions of section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(C)), was issued on October 23, 1973. It discussed the environmental impact of leasing federally owned geothermal resources under the proposed rulemaking, and proposed provisions for inclusion in regulations and leases to mitigate any possible impacts on the environment.

These regulations will be effective January 1, 1974.

GENERAL PROVISIONS

GENERAL PROVISIONS

§ 270.1 Purpose and authority.

The Geothermal Steam Act enacted on December 24, 1970 (84 Stat. 1566) referred to in this part as "the Act", authorizes the Secretary of the Interior to prescribe rules and regulations applicable to operations conducted under a lease granted pursuant to that Act, and for the development and conservation of geothermal steam and associated geothermal resources, the prevention of waste, the protection of the public interest, and the protection of water quality, and other environmental qualities. The regulations in this part shall be administered by the Director through the Chief, Conservation Division, or his duly appointed representative.

§ 270.2 Definitions.

As used in the regulations in this part, the term:

(a) "Secretary" means the Secretary of the Interior or any person duly authorized to exercise the powers vested in that officer.

(b) "Director" means the Director of the Geological Survey.

(c) "Supervisor" means a representative of the Secretary, subject to the direction and supervisory authority of the Director, the Chief, Conservation Division, Geological Survey, and the appropriate Regional Conservation Manager, Conservation Division, Geological Survey, authorized and empowered to regulate operations and to perform other duties prescribed in the regulations in this part or any subordinate of such a representative acting under his direction.

(d) "Geothermal lease" means a lease issued under 43 CFR Group 3200.

(e) "Lessee" means the individual, corporation, association, or municipality to which a geothermal lease has been issued and its successor in interest or assignee. It also means any agent of the lessee or an operator holding authority by or through the lessee.

(f) "Operator" means the individual, corporation, or association having control or management of operations on the leased lands or a portion thereof. The operator may be the lessee, designated operator, or agent of the lessee, or holder of rights under an approved operating agreement.

(g) "Geothermal resources" means (1) all products of geothermal processes, embracing indigenous steam, hot water, and hot brines; (2) steam and other gases, hot water, and hot brines, resulting from water, gas, or other fluids artificially introduced into geothermal formations; (3) heat or other associated energy found in geothermal formations; and (4) any byproduct derived therefrom.

(h) "Byproduct" means (1) any mineral or minerals (exclusive of oil, hydrocarbon gas, and helium), which are found in solution or developed in association with geothermal steam and which have a value of less than 75 per centum of the value of the geothermal steam or are not, because of quantity, quality, or technical difficulties in extraction and production, of sufficient value to warrant extraction and production by themselves, and (2) commercially demineralized water.

(i) "Participating area" means that part of the unit area which is deemed to be productive from a horizon or deposit and to which production would be allocated in the manner described in the unit agreement assuming that all lands are committed to the unit agreement.

(j) "Waste" means (1) physical waste, as that term is generally understood; (2) waste of reservoir energy through inefficiency, improper use of or unnecessary dissipation of reservoir energy; (3) the location, spacing, drilling, equipping, operating, or producing of any geothermal well or wells in a manner which causes or tends to cause reduction in the quantity of geothermal energy ultimately recoverable from a reservoir under prudent and workmanlike operations or which tends to cause unnecessary or excessive surface or subsurface loss or destruction of geothermal energy; and (4) the inefficient transmission of geothermal energy from the source (wellhead) to point of utilization.

(k) "Directionally drilled well" means the deviation of a well bore from the vertical or from its normal course in an intended predetermined direction or course with respect to the points of the compass. Directionally drilled well shall not include a well deviated for the purpose of straightening a hole that has become crooked in the normal course of drilling or holes deviated at random

without regard to compass direction in an attempt to sidetrack a portion of the hole on account of mechanical difficulty in drilling.

(l) "Geothermal resources operational order" or "GRO order" means a formal numbered order, issued by the Supervisor, with the prior approval of the Chief, Conservation Division, Geological Survey, which implements the regulations in this part and applies to operations in an area, region, or any significant portion thereof.

(m) "Producible well" means a well which is capable of producing geothermal resources in commercial quantities.

(n) "Commercial quantities" means quantities sufficient to provide a return after all variable costs of production have been met.

(o) "Area of operations" means that area of the leased lands which is required for exploration, development, and producing operations, and which is delineated on a map or plat which is made a part of the approved plan of operations. It encompasses the area generally needed for wells, flow lines, separators, surge tanks, drill pads, mud pits, workshops, and other such facilities used for on-project geothermal resources field exploration, development, and production operations.

JURISDICTION AND FUNCTIONS OF SUPERVISOR

§ 270.10 Jurisdiction.

Drilling and production operations, handling and measurement of production, determination and collection of royalty and, in general, all operations conducted on a geothermal lease are subject to the regulations in this part and the applicable regulations contained in 43 CFR Group 3200, and are under the jurisdiction of the Supervisor for the area in which the leased land is situated, subject to the supervisory authority of the Secretary and the Director.

§ 270.11 General functions.

The Supervisor is authorized and directed to carry out the provisions of this part. He will require compliance with the terms of geothermal leases, with the regulations in this part and the applicable regulations in 43 CFR Group 3200, and with the applicable statutes. He shall act on all applications, requests, and notices required in this part. In executing his functions under this part the Supervisor shall ensure that all operations, within the area of operations, will conform to the best practice and are conducted in such manner as to protect the deposits of the leased lands and to result in the maximum ultimate recovery of geothermal resources, with minimum waste, and are consistent with the principles of the use of the land for other purposes and of the protection of the environment. Inasmuch as conditions in one area may vary widely from conditions in another area, the regulations in this part are intended to be general in nature. Detailed procedures hereunder in any particular area will be covered by GRO orders. The requirements to be set forth in GRO orders relating to surface resources or uses will be coordinated with the appropriate land management agency. The Supervisor may issue oral orders to govern lease operations, but such orders shall be confirmed in writing by the Supervisor as promptly as possible. The Supervisor may issue other orders and rules to govern the development and method for production of a deposit, field, or area. Prior to the issuance of GRO orders and other orders and rules and the approval of any plan of operations, the Supervisor shall, consult with, and receive comments from appropriate Federal and State agencies, lessees, operators, or interested parties. Before permitting other operations on the leased land, the Supervisor shall determine if the lease is in good standing, whether the lessee is authorized to conduct operations, has filed an acceptable bond, and has an approved plan of operations.

§ 270.12 Regulation of operations.

The Supervisor shall inspect and supervise operations performed under the regulations in this part to: (a) Prevent waste and damage to formations or deposits containing geothermal resources; (b) prevent unnecessary damage to other natural resources; (c) prevent degradation of the water quality; (d) protect air quality, water quality, and other environmental qualities; and (e) prevent injury to life or property. The Supervisor shall issue such GRO orders as are necessary to accomplish these purposes.

§ 270.13 Required samples, tests, and surveys.

When necessary or advisable, the Supervisor shall require that adequate samples be taken and tests or surveys be made using acceptable techniques, without cost to the lessor, to determine the identity and character of formations; the presence of geothermal resources, water, or reservoir energy; the quantity and quality of geothermal resources, water or reservoir energy; the amount and direction of deviation of any well from the vertical; formation, casing, and tubing pressures, temperatures, rate of heat and fluid flow, and whether operations are conducted in a manner looking to the protection of the interests of the lessor.

§ 270.14 Drilling and abandonment of wells.

The Supervisor shall require that drilling be conducted in accordance with the terms of the lease, GRO orders, and the regulations in this part and 43 CFR Group 3200; and shall require plugging and abandonment of any well or wells no longer necessary for operations in accordance with plans approved or prescribed by him. Upon the failure of a lessee to comply with any requirement under this section, the Supervisor is authorized to perform the work at the expense of the lessee and the surety.

§ 270.15 Well spacing and well casing.

The Supervisor shall approve proposed well-spacing and well-casing programs or prescribe such modifications to the programs as he determines necessary for proper development, giving consideration to such factors as: (a) Topographic characteristics of the area; (b) hydrologic, geologic and reservoir characteristics of the field; (c) the number of wells that can be economically drilled to provide the necessary volume of geothermal resources for the intended use; (d) protection of correlative rights; (e) minimizing well interference; (f) unreasonable interference with multiple use of lands; and (g) protection of the environment, including ground water quality.

§ 270.16 Values and payment for losses.

The Supervisor shall determine the value of production accruing to the lessor where there is loss through waste or failure to drill and produce protection wells on the lease, and the compensation due to the lessor as reimbursement for such loss. Payment for such losses will be paid when billed.

§ 270.17 Suspension of operations and production.

(a) On receipt of an application filed in accordance with 43 CFR 3205.3–8 for suspension of operations or production, or both, under a producing geothermal lease (or for relief from any drilling or producing requirements of such a lease), the Supervisor may, if he deems the suspension or relief warranted, approve the application.

(b) In the interest of conservation, the Supervisor may, on his own motion, suspend operations or production, or both, on any geothermal lease.

(c) Where operations or production, or both, under a lease, have been suspended, the Supervisor may approve resumption of operations or production either on his own motion or upon written request by the lessee or his agent.

(d) Whenever it appears from facts adduced by or furnished to the Supervisor that the interest of the lessor requires additional drilling or producing operations, he may, by written notice, order the beginning or resumption of such operations.

(e) See 43 CFR 3205.3–7 and 3205.3–8 for regulations concerning requests to waive, suspend, or reduce payments of rental or royalty, and extensions of leases on which operations or production have been suspended.

REQUIREMENTS FOR LESSEES (INCLUDING OPERATORS)

§ 270.30 Lease terms, regulations, waste, damage, and safety.

(a) The lessee shall comply with the lease terms, lease stipulations, applicable laws and regulations and any amendments thereof, GRO orders, and other written or oral orders of the Supervisor. All oral orders (to be confirmed in writing as provided in § 270.11) are effective when issued unless otherwise specified.

(b) The lessee shall take all reasonable precautions to prevent: (1) Waste; (2) damage to any natural resource including trees and other vegetation, fish and wildlife and their habitat; (3) injury or damage to persons, real or personal property; and (4) any environmental pollution or damage.

(c) Any significant effect on the environment created by the lessee's operations or failure to comply with environmental standards shall be reported to the Supervisor within 24 hours and confirmed in writing within 30 days.

§ 270.31 Designation of operator or agent.

In all cases where operations are not conducted by the lessee but are to be conducted under authority of an unapproved operating agreement, assignment or other arrangement, a "designation of operator" shall be submitted to the Supervisor, in a manner and form approved by him, prior to commencement of operations. Such a designation will be accepted as authority of the operator or his local representative to act for the lessee and to sign any papers or reports required under the regulations in this part. All changes of address and any termination of the authority of the operator shall be immediately reported, in writing, to the Supervisor.

§ 270.32 Local agent.

When required by the Supervisor, the lessee shall designate a local representative empowered to receive notices and comply with orders of the Supervisor issued pursuant to the regulations in this part.

§ 270.33 Drilling and producing obligations.

(a) The lessee shall diligently drill and produce such wells as are necessary to protect the lessor from loss by reason of production on other properties, or in lieu thereof, with the consent of the Supervisor, shall pay a sum determined by the Supervisor as adequate to compensate the lessor for failure to drill and produce any such well.

(b) The lessee shall promptly drill and produce such other wells as the Supervisor may require in order that the lease be developed and produced in accordance with good operating practices. (See 43 CFR 3204.5.)

§ 270.34 Plan of operation.

Prior to commencing any operations on the leased lands or on any lands covered by a unit or cooperative agreement, the lessee shall submit in triplicate and obtain the approval of the Supervisor and the appropriate land management agency of a plan of operation for the area. Such plan shall include:

(a) The proposed location of each well including a layout showing the position of the mud tanks, reserve pits, cooling towers, pipe racks, etc.;

(b) Existing and planned access and lateral roads;

(c) Location and source of water supply and road building material;

(d) Location of camp sites, air-strips, and other supporting facilities;

(e) Other areas of potential surface disturbance;

(f) The topographic features of the land and the drainage patterns;

(g) Methods for disposing of waste material;

(h) A narrative statement describing the proposed measures to be taken for protection of the environment, including, but not limited to, the prevention or control of (1) fires, (2) soil erosion, (3) pollution of the surface and ground water, (4) damage to fish and wildlife or other natural resources, (5) air and noise pollution, and (6) hazards to public health and safety during lease activities;

(i) All pertinent information or data which the Supervisor may require to support the plan of operations for the utilization of geothermal resources and the protection of the environment;

(j) Provisions for monitoring deemed necessary by the Supervisor to ensure compliance with these regulations for the operations under the plan; and

(k) A requirement for the collection of data concerning the existing air and water quality, noise, seismic and land subsidence activities, and ecological system of the leased lands covering a period of at least one year prior to the submission of a plan for production. The informations required for paragraphs (a) through (f) of this section may be shown on a map or maps available from State or Federal sources.

§ 270.35 Subsequent well operations.

After completion of all operations authorized under any previously approved notice or plan, the lessee shall not begin to redrill, repair, deepen, plug back, shoot, or plug and abandon any well, make casing tests, alter the casing or liner, stimulate production, change the method of recovering production, or use any formation or well for brine or fluid injection until he has submitted to the Supervisor in writing a new plan of operations and has received written approval from him. However, in an emergency a lessee may take action to prevent damage without receiving prior approval from the Supervisor, but in such cases the lessee shall report his action to the Supervisor as soon as possible.

§ 270.36 Well designations.

The lessee shall mark each derrick upon commencement of drilling operations and each producing or suspended well in a conspicuous place with his name or the name of the operator, the serial number of the lease, the number and location of the well. Whenever possible, the well location shall be described by section or tract, township, range, and by quarter-quarter section or lot. The lessee shall take all necessary means and precautions to preserve these markings.

§ 270.37 Well records.

(a) The lessee shall keep for each well at his field headquarters or at other locations conveniently available to the Supervisor, accurate and complete records of all well operations including production, drilling, logging, directional well surveys, casing, perforation, safety devices, redrilling, deepening, repairing, cementing, alterations to casing, plugging, and abandoning. The records shall contain a description of any unusual malfunction, condition or problem; all the formations penetrated; the content and character of mineral deposits and water in each formation; thermal gradients, temperatures, pressures, analyses of geothermal waters, the kind, weight, size, grade, and setting depth of casing and any other pertinent information.

(b) The lessee shall, within 30 days after completion of any well, transmit to the Supervisor copies of the records of all operations in a form prescribed by the Supervisor.

(c) Upon request of the Supervisor, the lessee will furnish (1) legible, exact copies of service company reports on cementing, perforating, acidizing, analyses of cores, electrical, and temperature logs, chemical analyses of steam and waters, or other similar services; (2) other reports and records of operations in the manner and form prescribed by the Supervisor.

§ 270.38 Samples, tests, and surveys.

(a) The lessee, when required by the Supervisor, will make adequate sampling, tests and/or surveys using acceptable techniques, to determine the presence, quantity, quality, and potential of geothermal resources, mineral deposits, or water; the amount and direction of deviation of any well from the vertical; and/or formation temperatures and pressures, casing, tubing, or other pressures and such other facts as the Supervisor may require. Such tests or surveys shall be made without cost to the lessor.

(b) The lessee shall, without cost to the lessor, take such formation samples or cores to determine the identity and character of any formation as are required and prescribed by the Supervisor.

§ 270.39 Directional survey.

The Supervisor may require an angular deviation and directional survey to be made of the finished hole of each directionally drilled well. The survey shall be made at the risk and expense of the lessee unless requested by an offset lessee, and then, at the risk and expense of the offset lessee. A copy of the survey shall be furnished the Supervisor.

§ 270.40 Well control.

The lessee or operator shall: (a) Take all necessary precautions to keep all wells under control at all times; (b) utilize trained and competent personnel; (c) utilize properly maintained equipment and materials; and (d) use operating practices which insure the safety of life and property. The selection of the types and weights of drilling fluids and provisions for controlling fluid temperatures, blowout preventers, and other surface control equipment and materials, casing and cementing programs, etc., to be used shall be based on sound engineering principles and shall take into account apparent geothermal gradients, depths and

pressures of the various formations to be penetrated and other pertinent geologic and engineering data and information about the area.

§ 270.41 Pollution.

The lessee shall comply with all Federal and State standards with respect to the control of all forms of air, land, water, and noise pollution, including, but not limited to, the control of erosion and the disposal of liquid, solid, and gaseous wastes. The Supervisor may, in his discretion, establish additional and more stringent standards, and, if he does so, the lessee shall comply with those standards. Plans for disposal of well effluents must take into account effects on surface and subsurface waters, plants, fish and wildlife and their habitats, atmosphere, or any other effects which may cause or contribute to pollution, and such plans must be approved by the Supervisor before action is taken under them.

§ 270.42 Noise abatement.

The lessee shall minimize noise during exploration, development and production activities. Welfare of the operating personnel and the public must not be affected as a consequence of the noise created by the expanding gases. The method and degree of noise abatement shall be as approved by the Supervisor.

§ 270.43 Land subsidence and seismic activity.

In the event subsidence or seismic activity results from the production of geothermal resources, as determined by monitoring activities by the lessee or a government body, the lessee shall take such action as required by the lease or by the Supervisor.

§ 270.44 Pits and sumps.

The lessee shall provide and use pits and sumps of adequate capacity and design to retain all materials and fluids necessary to drilling, production, or other operations unless otherwise specified by the Supervisor. In no event shall the contents of a pit or sump be allowed to: (a) Contaminate streams, artificial canals or waterways, ground waters, lakes or rivers; (b) adversely affect environment, persons, plants, fish and wildlife and their habitats; or (c) damage the aesthetic values of the property or adjacent properties. When no longer needed, pits and sumps are to be filled and covered and the premises restored to a near natural state, as prescribed by the Supervisor.

§ 270.45 Well abandonment.

The lessee shall promptly plug and abandon any well on the leased land that is not used or useful. No well shall be abandoned until its lack of capacity for further profitable production of geothermal resources has been demonstrated to the satisfaction of the Supervisor. Before abandoning a producible well, the lessee shall submit to the Supervisor a statement of reasons for abandonment and his detailed plans for carrying on the necessary work. The detailed plans shall provide for the preservation of fresh water aquifers and for the prevention of intrusion into such aquifers of saline or polluted waters. A producible well may be abandoned only after receipt of written approval by the Supervisor. No well shall be plugged and abandoned until the manner and method of plugging have been approved or prescribed by the Supervisor. Equipment shall be removed, and premises at the well site shall be restored as near as reasonably possible to its original condition immediately after plugging operations are completed on any well except as otherwise authorized by the Supervisor. Drilling equipment shall not be removed from any suspended drilling well without taking adequate measures to close the well and protect the subsurface resources.

§ 270.46 Accidents.

The lessee shall take all reasonable precautions to prevent accidents and shall notify the Supervisor within 24 hours of all accidents on the leased land, and shall submit a full report thereon within 15 days

§ 270.47 Workmanlike operations.

The lessee shall carry on all operations and maintain the property at all times in a workmanlike manner, having due regard for the conservation of the property and the environment and for the health and safety of employees. The lessee shall remove from the property or store, in an orderly manner, all scrap or other materials not in use.

§ 270.48 Departure from orders.

The Supervisor may prescribe or approve either in writing or orally, with prompt written confirmation, variances from the requirements of GRO orders and other orders issued pursuant to these regulations, when such variances are necessary for the proper control of a well, conservation of natural resources, protection of human health and safety, property, or the environment. The Supervisor shall inform appropriate Federal and State agencies, of any action taken under this section.

§ 270.49 Sales contracts.

The lessee shall file with the Supervisor within 30 days after the effective date of the sales contract a copy of any contract for the disposal of geothermal resources from the lease.

§ 270.50 Royalty payments.

The lessee shall pay all royalties as due under the terms of the lease. Payments of royalties are due not later than the last day of the month following the month in which the resource is sold or utilized, and shall be by check, bank draft, or money order, drawn to the order of the United States Geological Survey.

MEASUREMENT OF PRODUCTION AND COMPUTATION OF ROYALTIES

§ 270.60 Measurement of geothermal resources.

The lessee shall measure or gauge all production in accordance with methods approved by the Supervisor. The quantity and quality of all production shall be determined in accordance with the standard practices, procedures, and specifications generally used in industry. All measuring equipment shall be tested periodically and, if found defective, the Supervisor will determine the quantity and quality of production from the best evidence available.

§ 270.61 Determination of content of byproducts.

The lessee shall periodically furnish the Supervisor the results of periodic tests showing the content of byproducts in the produced geothermal fluid and gases. Such tests shall be taken as specified by the Supervisor and by the method of testing approved by him.

§ 270.62 Value of geothermal production for computing royalties.

(a) The value of geothermal production from the leased premises for the purpose of computing royalties shall be the reasonable value of the energy and the byproducts attributable to the lease as determined by the Supervisor. In determining the reasonable value of the energy and the byproducts the Supervisor shall consider:

(1) The highest price paid for a majority of the production of like quality in the same field or area;

(2) The total consideration accruing to the lessee from any disposition of the geothermal production;

(3) The value of the geothermal production used by the lessee;

(4) The value and cost of alternate available energy sources and byproducts;

(5) The cost of exploration and production, exclusive of taxes;

(6) The economic value of the resource in terms of its ultimate utilization;

(7) Production agreements between producer and purchaser; and

(8) Any other matters which he may consider relevant.

(b) Under no circumstances shall the value of any geothermal production for the purposes of computing royalties be less than:

(1) The total consideration accruing to the lessee from the sale thereof in cases where geothermal resources are sold by the lessee to another party;

(2) That amount which is the value of the end product attributable to the geothermal resource produced from a particular lease where geothermal resources are not sold by the lessee before being utilized, but are instead directly used in manufacturing, power production, or other industrial activity; or

(3) When a part of the resource only is utilized by the lessee and the remainder sold, the sum of the value of the end product attributable to the geothermal resource and the sales price received for the geothermal resources

§ 270.63 Computation of royalties.

(a) The value of geothermal production from a particular lease as determined pursuant to § 270.62 hereof, shall be apportioned between geothermal steam, heat, and other forms of energy and the byproducts.

(b) The royalties payable shall be the sum of (1) the amount resulting from the multiplication of the value attributable to the geothermal steam, heat, and other forms of energy by the royalty rate set for such forms of geothermal energy in the lease and (2) the amount resulting from the multiplication of the value attributable to byproducts by the royalty rate for byproducts set in the lease.

§ 270.64 Commingling production.

The supervisor may authorize a lessee to commingle production from wells on his lease with production from other leases held by him or by other lessees subjects to such conditions as he may prescribe.

REPORTS TO BE MADE BY ALL LESSEES (INCLUDING OPERATORS)

§ 270.70 General requirements.

Information required to be submitted in accordance with the regulations in this part shall be furnished as directed by the Supervisor. Copies of forms can be obtained from the Supervisor and must be filed with that official within the time limit prescribed.

When forms or reports other than those referred to in the regulations in this part may be necessary, instructions for the filing of such forms or reports will be given by the Supervisor.

§ 270.71 Application for permit to drill, redrill, deepen, or plug-back.

(a) A permit to drill, redrill, deepen, or plug-back a well on Federal lands must be obtained from the Supervisor before the work is begun. The application for the permit, which shall be filed in triplicate with the Supervisor, shall state the location of the well in feet, and direction from the nearest section or tract lines as shown on the official plat of survey or protracted surveys; the altitude of the ground and derrick floor above sea level and how it was determined, and should be accompanied by a proposed plan of operations as required by these regulations.

(b) The proposed drilling and casing plan shall be outlined in detail under the heading "Details of Work" in the applications referred to herein, and shall describe the type of tools and equipment to be used, the proposed depth to which the well will be drilled, the estimated depths to the top of important markers, the estimated depths at which water, geothermal resources, or other mineral resources are expected, the proposed casing program (including the size and weight of casing), the depth at which each string is to be set, and the amount of cement and mud to be used, the drilling method and type of circulating media (water, mud, foam, air or combinations thereof), the type of blowout prevention equipment to be used, the proposed coring, logging, or other program (such as drilling time log and sample description) to be used to determine the formations penetrated and the proposed program for determining geothermal gradients and the sampling and analysis of geothermal resources.

(c) Each application shall be accompanied by a plat showing the surface and expected bottomhole locations and the distances from the nearest section or tract lines as shown on the official plat of survey or protracted surveys. The scale shall not be less than 2,000 feet to 1 inch.

(d) Each application should be accompanied by supporting structural and hydrologic information based on available geologic and geophysical data.

§ 270.72 Sundry notices and reports on wells.

(a) Any written notice of intention to do work or to change plans previously approved must be filed with the Supervisor in triplicate, unless otherwise directed, and must be approved by him before the work is begun. If, in case of emergency, any notice is given orally or by wire, and approval is obtained, the transaction shall be confirmed in writing. A subsequent report of the work performed must also be filed with the Supervisor.

(b) Casing test: Notice shall be given in advance to the Supervisor or his representative of the date and time when the operator expects to make a casing test. Later, by agreement, the exact time shall be fixed. In the event of casing failure during the test, the casing must be repaired or replaced or recemented as required by the Supervisor or his representative. The results of the test must be reported within 30 days after making a casing test. The report must describe the test completely and state the amount of mud and cement used, the lapse of time between running and cementing the casing and making the test, and the method of testing.

(c) Repairs or conditioning of well: Before the repairing or conditioning of a well, a notice setting forth in detail the plan of work must be filed with, and approved by, the Supervisor. A detailed report of the work accomplished and the methods employed, including all dates, and the results of such work must be filed within 30 days after completion of the repair work.

(d) Well stimulation: Before the lessee commences stimulation of a well by any means, a notice, setting forth in detail the plan of work, must be filed with and approved by the Supervisor. The notice shall name the type of stimulant and the amount to be used. A report showing the amount of stimulant used and the production rate before and after stimulation must be filed within 30 days from completion of the work.

(e) Altering casing in a well: Notice of intention to run a liner or to alter the casing by pulling or perforating by any means must be filed with and approved by the Supervisor before the work is started. This notice shall set forth in detail the plan of work. A report must be filed within 30 days after completion of the work stating exactly what was done and the results obtained.

(f) Notice of intention to abandon well: Before abandonment work is begun on any well, whether a drilling well, geothermal resources well, water well, or so-called dry hole, notice of intention to abandon shall be filed with, and approved by, the Supervisor. The notice must be accompanied by a complete log, in duplicate, of the well to date, provided the complete log has not been filed previously, and must give a detailed statement of the proposed work, including such information as kind, location, and length of plugs (by depths), plans for mudding, cementing, shooting, testing, and removing casing, and any other pertinent information.

(g) Subsequent report of abandonment: After a well is abandoned or plugged, a subsequent record of work done must be filed with the Supervisor. This report shall be filed separately within 30 days after the work is done. The report shall give a detailed account of the manner in which the abandonment or plugging work was carried out, including the nature and quantities of materials used in plugging and the location and extent (by depths) of the plugs of different materials; records of any tests or measurements made, and of the amount, size, and location (by depths) of casing left in the well; and a detailed statement of the volume of mud fluid used, and the pressure attained in mudding. If an attempt was made to part any casing, a complete report of the methods used and results obtained must be included.

§ 270.73 Log and history of well.

The lessee shall furnish in duplicate to the Supervisor, not later than 30 days after the completion of each well, a complete and accurate log and history, in chronological order, of all operations conducted on the well. A log shall be compiled for geologic information from cores or formations samples and duplicate copies of such log shall be filed. Duplicate copies of all electric logs, temperature surveys, water and steam analyses, hydrologic or heat flow tests, or direction surveys, if run, shall be furnished.

§ 270.74 Monthly report of operations.

A report of operations for each lease must be made for each calendar month, beginning with the month in which drilling operations are initiated. The report must be filed in duplicate with the Supervisor on or before the last day of the month following the month for which the report is filed unless an extension of

time for the filing of the report is granted by the Supervisor. The report shall disclose accurately all operations conducted on each well during the month, the status of operations on the last day of the month, and a general summary of the status of operations on the leased lands. The report must be submitted each month until the lease is terminated or until omission of the report is authorized by the Supervisor. The report shall show for each calendar month:

(a) The lease serial number or the unit or communitization agreement number which shall be inserted in the upper right corner;

(b) Each well listed separately by number, and its location by 40-acre subdivision (quarter-quarter section or lot), section number, township, range, and meridian;

(c) The number of days each well was produced, whether steam or hot water or both were produced, and the number of days each input well was in operation, if any;

(d) The quantity of production and any byproducts obtained from each well, if any are recovered;

(e) The depth of each active or suspended well, and the name, character, and depth of each formation drilled during the month, the date and reason for every shutdown, the names and depths of important formation changes, the amount and size of any casing run since the last report, the dates and results of any tests or environmental monitoring conducted, and any other noteworthy information on operations not specifically provided for in the form.

(f) The footnote must be completely filled out as required by the Supervisor. If no sales were made during the calendar month, the report must so state.

§ 270.75 Monthly report of sales and royalty.

A report of sales and royalty for each productive lease must be filed each month once sales of production are made even though sales may be intermittent, unless otherwise authorized by the Supervisor. Total volumes of geothermal resources produced and sold, the value of production, and the royalty due the lessor must be shown. If byproducts are being recovered, the same requirement shall be applicable. This report is due on or before the last day of the month following the month in which production was obtained and sold or utilized, together with the royalties due the United States. Payment or royalty is to be made pursuant to § 270.50 unless otherwise authorized by the Supervisor.

§ 270.76 Annual report of compliance with environmental protection requirements.

The lessee shall submit annually a report giving a full account of the actions taken to comply with the appropriate Federal and State regulations or requirements of the Supervisor pertaining to the protection of the surface and subsurface environment. This report shall include but is not limited to such matters as:

(a) Noise abatement;
(b) Water quality;
(c) Air quality;
(d) Erosion control;
(e) Subsidence and seismic activity;
(f) Rehabilitation activities;
(g) Waste disposal; and
(h) Environmental effects on flora and fauna.

§ 270.77 Annual report of expenditures for diligent exploration operations.

A report of expenditures for exploration operations conducted during a lease year must be submitted annually to the Supervisor in order that such expenditures may be considered for qualification as diligent exploration pursuant to 43 CFR 3203.5.

§ 270.78 Notice of intent and permit to conduct exploration operations other than drilling, see 43 CFR 3209.0–5 (a)).

(a) A permit to conduct exploration operations on the leased lands or on any lands covered by a unit or cooperative agreement must be obtained from the Supervisor before the work is begun. The form used for exploration operations conducted pursuant to 43 CFR 3209 will be acceptable.

(b) The notice of intent shall be filed in triplicate with the Supervisor and shall include:

(1) The name and address, including zip code, both of the person, association, or corporation for whom the operations will be conducted and of the person who will be in charge of the actual exploration activities;

(2) A statement that the signers agree that exploration operations will be conducted pursuant to the terms and conditions listed on the approved form;

(3) A brief description of the type of operations which will be undertaken;

(4) The approximate dates of the commencement and termination of exploration operations; and

(5) A plan of operation as required by § 270.34 covering paragraphs (a) through (h), of this section.

(c) The lessee shall, within 30 days after completion of such operations, furnish the Supervisor two copies of the records of the operation.

§ 270.79 Public inspection of records.

Geologic and geophysical interpretations, maps, and data required to be submitted under this part shall not be available for public inspection without the consent of the lessee so long as the lease remains in effect.

PROCEDURE IN CASE OF VIOLATION OF THE REGULATIONS OR LEASE TERMS

§ 270.80 Noncompliance with regulations or lease terms.

(a) Whenever a lessee or anyone acting under his authority fails to comply with the provisions of the regulations or lease terms, the Supervisor shall give the lessee notice to remedy any defaults or violations. Failure by the lessee to perform or commence the necessary remedial action pursuant to the notice may result in a shut down of operations and may result in referral of the matter to the authorized offices of the Bureau of Land Management for action pursuant to 43 CFR 3244.3.

(b) The Supervisor is authorized to shut down any operations which he determines are unsafe or are causing or can cause pollution.

APPEALS

§ 270.90 Appeals.

Appeals from final orders or decisions issued under the regulations in this part shall be made in the manner provided in 30 CFR Part 290.

PART 271—GEOTHERMAL RESOURCES UNIT PLAN REGULATIONS (INCLUDING SUGGESTED FORMS)

GENERAL PROVISIONS

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AUTHORITY: Section 18 of the Geothermal Steam Act of 1970 (84 Stat. 1566) (see 43 CFR Subpart 3244).

§ 271.1 Introduction.

The regulations in this part prescribe the procedure to be followed and the requirements to be met by holders of Federal geothermal leases (see § 271.2d) and their representatives who wish to unite with each other, or jointly or separately with others, in collectively adopting and operating under a cooperative or unit plan for the development of any geothermal resources pool, field, or like area, or any part thereof. Such agreements may be initiated by lessees, or where in the interest of conserving natural resources they are deemed necessary they may be required by the Director.

§ 271.2 Definitions.

The following terms, as used in this part or in any agreement approved under the regulations in this part, shall have the meanings here indicated unless otherwise defined in such agreement:

(a) *Unit agreement.* An agreement or plan of development and operation for the production and utilization of separately owned interests in the geothermal resources made subject thereto

as a single consolidated unit without regard to separate ownerships and which provides for the allocation of costs and benefits on a basis defined in the agreement or plan.

(b) *Cooperative agreement.* An agreement or plan of development and operations for the production and utilization of geothermal resources made subject thereto in which separate ownership units are independently operated without allocation of production.

(c) *Agreement.* For convenience, the term "agreement" as used in the regulations in this part refers to either a unit or a cooperative agreement as defined in paragraphs (a) and (b) of this section unless otherwise indicated.

(d *Geothermal lease.* A lease issued under the act of December 24, 1970 (84 Stat. 1566), pursuant to the leasing regulations contained in 43 CFR Part 3200, and, unless the context indicates otherwise, "lease" means a geothermal lease.

(e) *Unit area.* The area described in a unit agreement as constituting the land logically subject to development under such agreement.

(f) *Unitized land.* The part of a unit area committed to a unit agreement.

(g) *Unitized substances.* Deposits of geothermal resources recovered from unitized land by operation under and pursuant to a unit agreement.

(h) *Unit operator.* The person, association, partnership, corporation, or other business entity designated under a unit agreement to conduct operations on unitized land as specified in such agreement.

(i) *Participating area.* That part of the Unit Area which is deemed to be productive from a horizon or deposit and to which production would be allocated in the manner described in the unit agreement assuming that all lands are committed to the unit agreement.

(j) *Working interest.* The interest held in geothermal resources or in lands containing the same by virtue of a lease, operating agreement, fee title, or otherwise, under which, except as otherwise provided in a unit or cooperative agreement, the owner of such interest is vested with the right to explore for, develop, produce, and utilize such resources. The right delegated to the unit operator as such by the unit agreement is not to be regarded as a working interest.

(k) *Secretary.* The Secretary of the Interior or any person duly authorized to exercise powers vested in that officer.

(l) *Director.* The Director of the U.S. Geological Survey.

(m) *Supervisor.* A representative of the Secretary, subject to the direction and supervisory authority of the Director, the Chief, Conservation Division, Geological Survey, and the appropriate Regional Conservation Manager, Conservation Division, Geological Survey, authorized and empowered to regulate operations and to perform other duties prescribed in the regulations in this part or any subordinate of such representative acting under his direction.

§ 271.3 Designation of area.

An application for designation of an area as logically subject to development and/or operation under a unit or cooperative agreement may be filed, in triplicate, by any proponent of such an agreement through the Supervisor. Each copy of the application shall be accompanied by a map or diagram on a scale of not less than 1 inch to 1 mile, outlining the area sought to be designated under this section. The Federal, State, and privately owned land should be indicated on said map by distinctive symbols or colors and Federal geothermal leases and lease applications should be identified by serial number. Geological information, including the results of geophysical surveys, and such other information as may tend to show that unitization is necessary and advisable in the public interest should be furnished in triplicate. Geological and geophysical information and data so furnished will not be available for public inspection, as provided by 5 U.S.C. section 552(b), without the consent of the proponent. The application and supporting data will be considered by the Director and the applicant will be informed of the decision reached. The designation of an area, pursuant to an application filed under this section, shall not create an exclusive right to submit an executed agreement for such area, nor preclude the inclusion of such area or any part thereof in another unit area.

§ 271.4 Preliminary consideration of agreements.

The form of unit agreement set forth in § 271.12 is acceptable for use in unproved areas. The use of this form is not mandatory, but any proposed departure therefrom should be submitted with the application submitted under § 271.3 for preliminary consideration and for such revision as may be deemed necessary. In areas proposed for unitization in which a discovery of geothermal resources has been made, or where a cooperative agreement is contemplated, the proposed agreement should be submitted with the application submitted under § 271.3 for preliminary consideration and for such revision as may be deemed necessary. The proposed form of agreement should be submitted in triplicate and should be plainly marked to identify the proposed variances from the form of agreement set forth in § 271.12.

§ 271.5 State land.

Where State-owned land is to be included in the unit, approval of the agreement by appropriate State officials should be obtained prior to its submission to the Department for approval of the executed agreement. When authorized by the laws of the State in which the unitized land is situated, provisions may be made in the agreement accepting State law, to the extent that they are applicable to non-Federal unitized land.

§ 271.6 Qualifications of unit operator.

A unit operator must qualify as to citizenship in the same manner as those holding interests in geothermal leases issued under the Geothermal Steam Act of 1970. The unit operator may be an owner of a working interest in the unit area or such other party as may be selected by the owners of working interests and approved by the Supervisor. The unit operator shall execute an acceptance of the duties and obligations imposed by the agreement. No designation of, or change in, a unit operator will become effective unless and until approved by the Supervisor, and no such approval will be granted unless the unit operator is deemed qualified to fulfill the duties and obligations prescribed in the agreement.

§ 271.7 Parties to unit or cooperative agreement.

The owners of any rights, title, or interest in the geothermal resources deposits to be developed and operated under an agreement can be regarded as proper parties to a proposed agreement. All such owners must be invited to join as parties to the agreement. If any owner fails or refuses to join the agreement, the proponent of the agreement should declare this to the Supervisor and should submit evidence of efforts made to obtain joinder of such owner and the reasons for nonjoinder.

§ 271.8 Approval of an executed unit or cooperative agreement.

(a) A duly executed unit or cooperative agreement will be approved by the Secretary, or his duly authorized representative, upon a determination that such agreement is necessary or advisable in the public interest and is for the purpose of properly conserving the natural resources. Taking into account the environmental consequences of the action. Such approval will be incorporated in a certificate appended to the agreement. No such agreement will be approved unless at least one of the parties is a holder of a Federal lease embracing lands being committed to the agreement and unless the parties signatory to the agreement hold sufficient interests in the area to give effective control of operations therein.

(b) Where a duly executed agreement is submitted for Departmental approval, a minimum of six signed counterparts should be filed. The same number of counterparts should be filed for documents supplementing, modifying, or amending an agreement, including change of operator, designation of new operator, and notice of surrender, relinquishment, or termination.

(c) The address of each signatory party to the agreement should be inserted below the party's signature. Each signature should be attested by at least one witness, if not notarized. Corporate or other signatures made in a representative capacity must be accompanied by evidence of the authority of the signatories to act unless such evidence is already a matter of record in the United

States Geological Survey. (The parties may execute any number of counterparts of the agreement with the same force and effect as if all parties signed the same document, or may execute a ratification or consent in a separate instrument with like force and effect.).

(d) Any modification of an approved agreement will require approval of the Secretary or his duly authorized representative under procedures similar to those cited in paragraph (a) of this section.

§ 271.9 Filing of papers and number of counterparts.

(a) All proposals and supporting papers, instruments, and documents submitted under this part should be filed with the Supervisor, unless otherwise provided in this part or otherwise instructed by the Director.

(b) Plans of development and operation, plans of further development and operation, and proposed participating areas and revisions thereof should be submitted in quadruplicate.

(c) Each application for approval of a participating area, or revision thereof, should be accompanied by three copies of a substantiating geologic and engineering report, structure contour map or maps, cross-section or other pertinent data.

(d) Other instruments or documents submitted for approval should be submitted for approval in sufficient number to permit the approving official to return at least one approved counterpart.

§ 271.10 Bonds.

In lieu of separate bonds required for each Federal lease committed to a unit agreement, the unit operator may furnish and maintain a collective corporate surety bond or a personal bond conditioned upon faithful performance of the duties and obligations of the agreement and the terms of the leases subject thereto. Personal bonds shall be accompanied by a deposit of negotiable Federal securities in a sum equal at their par value to the amount of the bond and by a proper conveyance to the Secretary of full authority to sell such securities in case of default in the performance of the obligations assumed. The liability under the bond shall be for such amount as the Supervisor shall determine to be adequate to protect the interests of the United States. Additional bond coverage may be required whenever deemed necessary by the Supervisor. The bond must be filed with and accepted by the Bureau of Land Management before operations will be approved. A form of corporate surety bond is set forth in § 271.15. In case of changes of unit operator, a new bond must be filed or a consent of surety to the change in principal under the existing bond must be furnished.

§ 271.11 Appeals.

Appeals from final orders or decisions issued under the regulations in this part shall be made in the manner provided in 30 CFR Part 290.

§ 271.12 Form of unit agreement for unproved areas.

UNIT AGREEMENT FOR THE DEVELOPMENT AND OPERATION OF THE ---------- UNIT AREA
COUNTY OF ----------
STATE OF ----------

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---------- UNIT AGREEMENT
---------- COUNTY ----------

This Agreement entered into as of the ------ day of ----------, 19--, by and between the parties subscribing, ratifying, or consenting hereto, and herein referred to as the "parties hereto".

WITNESSETH: Whereas the parties hereto are the owners of working, royalty, or other geothermal resources interests in land subject to this Agreement; and

Whereas the Geothermal Steam Act of 1970 (84 Stat. 1566), hereinafter referred to as the "Act", authorizes Federal lessees and their representatives to unite with each other, or jointly or separately with others, in collectively adopting and operating under a cooperative or unit plan of development or operation of any geothermal resources pool, field, or like area, or any part thereof, for the purpose of more properly conserving the natural resources thereof, whenever determined and certified by the Secretary of the Interior to be necessary or advisable in the public interest; and

Whereas the parties hereto hold sufficient interest in the ---------- Unit Area covering the land herein described to effectively control operations therein; and

Whereas, it is the purpose of the parties hereto to conserve natural resources, prevent waste, and secure other benefits obtainable through development and operations of the area subject to this Agreement under the terms, conditions, and limitations herein set forth;

Now, therefore, in consideration of the premises and the promises herein contained, the parties hereto commit to this agreement their respective interests in the below-defined Unit Area, and agree severally among themselves as follows:

ARTICLE I—ENACLING ACT AND REGULATIONS

1.1 The Act and all valid pertinent regulations, including operating and unit plan regulations, heretofore or hereafter issued thereunder are accepted and made a part of this agreement as to Federal lands.

1.2 As to non-Federal lands, the geothermal resources operating regulations in effect as of the effective date hereof governing drilling and producing operations, not inconsistent with the laws of the State in which the non-Federal land is located, are hereby accepted and made a part of this agreement.

ARTICLE II—DEFINITIONS

2.1 The following terms shall have the meanings here indicated:

(a) *Geothermal lease.* A lease issued under the act of December 24, 1970 (84 Stat. 1566), pursuant to the leasing regulations contained in 43 CFR Group 3200 and, unless the context indicates otherwise, "lease" shall mean a geothermal lease.

(b) *Unit area.* The area described in Article III of this Agreement.

(c) *Unit Operator.* The person, association, partnership, corporation, or other business entity designated under this Agreement to conduct operations on Unitized Land as specified herein.

(d) *Participating area.* That part of the Unit Area which is deemed to be productive from a horizon or deposit and to which production would be allocated in the manner described in the unit agreement assuming that all lands are committed to the unit agreement.

(e) *Working interest.* The interest held in geothermal resources or in lands containing the same by virtue of a lease, operating agreement, fee title, or otherwise, under which, except as otherwise provided in this Agreement, the owner of such interest is vested with the right to explore for, develop, produce and utilize such resources. The right delegated to the Unit Operator as such by this Agreement is not to be regarded as a Working Interest.

(f) *Secretary.* The Secretary of the Interior or any person duly authorized to exercise powers vested in that officer.

(g) *Director.* The Director of the U.S. Geological Survey.

(h) *Supervisor.* A representative of the Secretary, subject to the direction and supervisory authority of the Director, the Chief, Conservation Division, Geological Survey, and the appropriate Regional Conservation Manager, Conservation Division, Geological Survey, authorized and empowered to regulate operations and to perform other duties prescribed in the regulations in this part or any subordinate of such representative acting under his direction.

ARTICLE III—UNIT AREA AND EXHIBITS

3.1 The area specified on the map attached hereto marked "Exhibit A" is hereby designated and recognized as constituting the Unit Area, containing ---------- acres, more or less.

The above-described Unit Area shall when practicable be expanded to include therein any additional lands or shall be contracted to exclude lands whenever such expansion or contraction is deemed to be necessary or advisable to conform with the purposes of this Agreement.

3.2 Exhibit A attached hereto and made a part hereof is a map showing the boundary

of the Unit Area, the boundaries and identity of tracts and leases in said area to the extent known to the Unit Operator.

3.3 Exhibit B attached hereto and made a part hereof is a schedule showing to the extent known to the Unit Operator the acreage, percentage, and kind of ownership of geothermal resources interests in all lands in the Unit Area.

3.4 Exhibits A and B shall be revised by the Unit Operator whenever changes in the Unit Area render such revision necessary, or when requested by the Supervisor, and not less than five copies of the revised Exhibits shall be filed with the Supervisor.

ARTICLE IV—CONTRACTION AND EXPANSION OF UNIT AREA

4.1 Unless otherwise specified herein, the expansion and/or contraction of the Unit Area contemplated in Article 3.1 hereof shall be effected in the following manner:

(a) Unit Operator either on demand of the Director or on its own motion and after prior concurrence by the Director, shall prepare a notice of proposed expansion or contraction describing the contemplated changes in the boundaries of the Unit Area, the reasons therefore, and the proposed effective date thereof, preferably the first day of a month subsequent to the date of notice.

(b) Said notice shall be delivered to the Supervisor, and copies thereof mailed to the last known address of each Working Interest Owner, Lessee, and Lessor whose interests are affected, advising that 30 days will be allowed for submission to the Unit Operator of any objections.

(c) Upon expiration of the 30-day period provided in the preceding item (b) hereof, Unit Operator shall file with the Supervisor evidence of mailing of the notice of expansion or contraction and a copy of any objections thereto which have been filed with the Unit Operator, together with an application in sufficient number, for approval of such expansion or contraction and with appropriate joindere.

(d) After due consideration of all pertinent information, the expansion or contraction shall, upon approval by the Supervisor, become effective as of the date prescribed in the notice thereof.

4.2 Unitized Leases, insofar as they cover any lands which are excluded from the Unit Area under any of the provisions of this Article IV may be maintained and continued in force and effect in accordance with the terms, provisions, and conditions contained in the Act, and the lease or leases and amendments thereto, except that operations and/or production under this Unit Agreement shall not serve to maintain or continue the excluded portion of any lease.

4.3 All legal subdivisions of unitized lands (i.e., 40 acres by Governmental survey or its nearest lot or tract equivalent in instances of irregular surveys), no part of which is entitled to be within a Participating Area on the fifth anniversary of the effective date of the initial Participating Area established under this Agreement, shall be eliminated automatically from this Agreement effective as of said fifth anniversary and such lands shall no longer be a part of the Unit Area and shall no longer be subject to this Agreement unless diligent drilling operations are in progress on an exploratory well on said fifth anniversary, in which event such lands shall not be eliminated from the Unit Area for as long as exploratory drilling operations are continued diligently with not more than four (4) months time elapsing between the completion of one exploratory well and the commencement of the next exploratory well.

4.4 An exploratory well, for the purposes of this Article IV is defined as any well, regardless of surface location, projected for completion in a zone or deposit below any zone or deposit for which a Participating Area has been established and is in effect, or any well, regardless of surface location, projected for completion at a subsurface location under Unitized Lands not entitled to be within a Participating Area.

4.5 In the event an exploratory well is completed during the four (4) months immediately preceding the fifth anniversary of the initial Participating Area established under this Agreement, lands not entitled to be within a Participating Area shall not be eliminated from this Agreement on said fifth anniversary, provided the drilling of another exploratory well is commenced under an approved Plan of Operation within four (4) months after the completion of said well. In such event, the land not entitled to be in participation shall not be eliminated from the Unit Area so long as exploratory drilling operations are continued diligently with not more than four (4) months time elapsing between the completion of one exploratory well and the commencement of the next exploratory well.

4.6 With prior approval of the Supervisor, a period of time in excess of four (4) months may be allowed to elapse between the completion of one well and the commencement of the next well without the automatic elimination of nonparticipating acreage.

4.7 Unitized lands proved productive by drilling operations which serve to delay automatic elimination of lands under this Article IV shall be incorporated into a Participating Area (or Areas) in the same manner as such lands would have been incorporated in such areas had such lands been proven productive during the year preceding said fifth anniversary.

4.8 In the event nonparticipating lands are retained under this Agreement after the fifth anniversary of the initial Participating Area as a result of exploratory drilling operations, all legal subdivisions of unitized land (i.e., 40 acres by Government survey or its nearest lot or tract equivalent in instances of irregular Surveys), no part of which is entitled to be within a Participating Area shall be eliminated automatically as of the 121 day, or such later date as may be established by the Supervisor, following the completion of the last well recognized as delaying such automatic elimination beyond the fifth anniversary of the initial Participating Area established under this Agreement.

ARTICLE V—UNITIZED LAND AND UNITIZED SUBSTANCES

5.1 All land committed to this Agreement shall constitute land referred to herein as "Unitized Land". All geothermal resources in and produced from any and all formations of the Unitized Land are unitized under the terms of this agreement and herein are called "Unitized Substances."

ARTICLE VI—UNIT OPERATOR

6.1 _____ is hereby designated as Unit Operator and by signature hereto as Unit Operator agrees and consents to accept the duties and obligations of Unit Operator for the discovery, development, production, distribution and utilization of Unitized Substances as herein provided. Whenever reference is made herein to the Unit Operator, such reference means the Unit Operator acting in that capacity and not as an owner of interest in Unitized Substances, and the term "Working Interest Owner" when used herein shall include or refer to Unit Operator as the owner of a Working Interest when such an interest is owned by it.

ARTICLE VII—RESIGNATION OR REMOVAL OF UNIT OPERATOR

7.1 Prior to the establishment of a Participating Area, hereunder, Unit Operator shall have the right to resign. Such resignation shall not become effective so as to release Unit Operator from the duties and obligations of Unit Operator or terminate Unit Operators rights, as such, for a period of six (6) months after notice of its intention to resign has been served by Unit Operator on all Working Interest Owners and the Supervisor, nor until all wells then drilled hereunder are placed in a satisfactory condition for suspension or abandonment whichever is required by the Supervisor, unless a new Unit Operator shall have been selected and approved and shall have taken over and assumed the duties and obligations of Unit Operator prior to the expiration of said period.

7.2 After the establishment of a Participating Area hereunder Unit Operator shall have the right to resign in the manner and subject to the limitations provided in 7.1 above.

7.3 The Unit Operator may, upon default or failure in the performance of its duties or obligations hereunder, be subject to removal by the same percentage vote of the owners of Working Interests as herein provided for the selection of a new Unit Operator. Such removal shall be effective upon notice thereof to the Supervisor.

7.4 The resignation or removal of Unit Operator under this Agreement shall not terminate its right, title, or interest as the owner of a Working Interest or other interest in Unitized Substances, but upon the resignation or removal of Unit Operator becoming effective, such Unit Operator shall deliver possession of all wells, equipment, material, and appurtenances used in conducting the unit operations to the new duly qualified successor Unit Operator or, if no such new unit operator is elected, to the common agent appointed to represent the Working Interest Owners in any action taken hereunder to be used for the purpose of conducting operations hereunder.

7.5 In all instances of resignation or removal, until a successor Unit Operator is selected and approved as hereinafter provided, the Working Interest Owners shall be jointly responsible for performance of the duties and obligations of Unit Operator, and shall not later than 30 days before such resignation or removal becomes effective appoint a common agent to represent them in any action to be taken hereunder.

7.6 The resignation of Unit Operator shall not release Unit Operator from any liability for any default by it hereunder occurring prior to the effective date of its resignation.

ARTICLE VIII—SUCCESSOR UNIT OPERATOR

8.1 If, prior to the establishment of a Participating Area hereunder, the Unit Operator shall resign as Operator, or shall be removed as provided in Article VII, a successor Unit Operator may be selected by vote of the owners of a majority of the Working Interests in Unitized Substances, based on their respective shares, on an acreage basis, in the Unitized Land.

8.2 If, after the establishment of a Participating Area hereunder, the Unit Operator shall resign as Unit Operator, or shall be removed as provided in Article VII, a successor Unit Operator may be selected by vote of the owners of a majority of the Working Interests in Unitized Substances, based on their respective shares, on a participating acreage basis. Provided, that, if a majority but less than 60 percent of the Working Interest in the Participating Lands is owned by the party to this agreement, a concurring vote of one or more additional Working Interest Owners owning 10 percent or more of the Working Interest in the participating land shall be required to select a new Unit Operator.

8.3 The selection of a successor Unit Operator shall not become effective until

(a) The Unit Operator so selected shall accept in writing the duties, obligations and responsibilities of the Unit Operator, and

(b) The selection shall have been approved by the Supervisor.

8.4 If no successor Unit Operator is selected and qualified as herein provided, the Director at his election may declare this Agreement terminated.

ARTICLE IX—ACCOUNTING PROVISIONS AND UNIT OPERATING AGREEMENT

9.1 Costs and expenses incurred by Unit Operator in conducting unit operations hereunder shall be paid and apportioned among and borne by the owners of Working Interests; all in accordance with the agreement or agreements entered into by and between the Unit Operator and the owners of Working Interests, whether one or more, separately or collectively.

9.2 Any agreement or agreements entered into between the Working Interest Owners and the Unit Operator as provided in this Article, whether one or more, are herein referred to as the "Unit Operating Agreement".

9.3 The Unit Operating Agreement shall provide the manner in which the Working Interest Owners shall be entitled to receive their respective share of the benefits accruing hereto in conformity with their underlying operating agreements, leases, or other contracts, and such other rights and obligations, as between Unit Operator and the Working Interest Owners.

9.4 Neither the Unit Operating Agreement nor any amendment thereto shall be deemed either to modify any of the terms and conditions of this Agreement or to relieve the Unit Operator of any right or obligation established under this Agreement.

9.5 In case of any inconsistency or conflict between this Agreement and the Unit Operating Agreement, this Agreement shall govern.

9.6 Three true copies of any Unit Operat-'ng Agreement executed pursuant to this Article IX shall be filed with the Supervisor prior to approval of this Agreement.

ARTICLE X—RIGHTS AND OBLIGATIONS OF UNIT OPESATOa

10.1 The right, privilege, and duty of exercising any and all rights of the parties hereto which are necessary or convenient for prospecting, producing, distributing or utilizing Unitized Substances are hereby delegated to and shall be exercised by the Unit Operator as provided in this Agreement in accordance with a Plan of Operations approved by the Supervisor.

10.2 Upon request by Unit Operator, acceptable evidence of title to geothermal resources interests in the Unitized Land shall be deposited with the Unit Operator, and together with this Agreement shall constitute and define the rights, privileges, and obligations of Unit Operator.

10.3 Nothing in this Agreement shall be construed to transfer title to any land or to any lease or operating agreement, it being understood that the Unit Operator, in its capacity as Unit Operator shall exercise the rights of possession and use vested in the parties hereto only for the purposes specified in this Agreement.

10.4 The Unit Operator shall take such measures as the Supervisor deems appropriate and adequate to prevent drainage of Unitized Substances from Unitized Land by wells on land not subject to this Agreement.

10.5 The Director is hereby vested with authority to alter or modify from time to time, in his discretion, the rate of prospecting and development and the quantity and rate of production under this Agreement.

ARTICLE XI—PLAN OF OPERATION

11.1 Concurrently with the submission of this Agreement for approval, Unit Operator shall submit an acceptable initial Plan of Operation. Said plan shall be as complete and adequate as the Supervisor may determine to be necessary for timely exploration and/or development and to insure proper protection of the environment and conservation of the natural resources of the Unit Area.

11.2 Prior to the expiration of the initial Plan of Operation, or any subsequent Plan of Operation, Unit Operator shall submit for approval of the Supervisor an acceptable subsequent Plan of Operation for the Unit Area which, when approved by the Supervisor, shall constitute the exploratory and/or development drilling and operating obligations of Unit Operators under this Agreement for the period specified therein.

11.3 Any plan of Operation submitted hereunder shall

(a) Specify the number and locations of any wells to be drilled and the proposed order and time for such drilling, and

(b) To the extent practicable, specify the operating practices regarded as necessary and advisable for proper conservation of natural resources and protection of the environment in compliance with section 1.1.

11.4 The Plan of Operation submitted concurrently with this Agreement for approval shall prescribe that within six (6) months after the effective date hereof, the Unit Operator shall begin to drill an adequate test well at a location approved by the Supervisor, unless on such effective date a well is being drilled conformably with the terms, hereof, and thereafter continue such drilling diligently until the _____ formation has been tested or until at a lesser depth unitized substances shall be discovered which can be produced in paying quantities (i.e., quantities sufficient to repay the costs of drilling, completing, and producing operations, with a reasonable profit) or the Unit Operator shall at any time establish to the satisfaction of the Supervisor that further drilling of said well would be unwarranted or impracticable, provided, however, that Unit Operator shall not in any event be required to drill said well to a depth in excess of _____ feet.

11.5 The initial Plan of Operation and/or subsequent Plans of Operation submitted under this article shall provide that the Unit Operator shall initiate a continuous drilling program providing for drilling of no less than one well at a time, and allowing no more than six (6) months time to elapse between completion of one well and the beginning of the next well, until a well capable of producing Unitized Substances in paying quantities is completed to the satisfaction of the Supervisor or until it is reasonably proved that the Unitized Land is incapable of producing Unitized Substsnces in paying quantities in the formations drilled under this Agreement.

11.6 When warranted by unforeseen circumstances, the Supervisor may grant a single extension of any or all of the critical dates for exploratory drilling operations cited in the initial or subsequent Plans of Operation. No such extension shall exceed a period of four (4) months for each well, required by the initial Plan of Operation.

11.7 Until there is actual production of Unitized Substances, the failure of Unit Operator to timely drill any of the wells provided for in Plans of Operation required under this Article XI or to timely submit an acceptable subsequent Plan of Operations, shall, after notice of default or notice of prospective default to Unit Operator by the Supervisor and after failure of Unit Operator to remedy any actual default within a reasonable time (as determined by the Supervisor), result in automatic termination of this Agreement effective as of the date of the default, as determined by the Supervisor.

11.8 Separate Plans of Operations may be submitted for separate productive zones, subject to the approval of the Supervisor. Also subject to the approval of the Supervisor, Plans of Operation shall be modified or supplemented when necessary to meet changes in conditions or to protect the interest of all parties to this Agreement.

ARTICLE XII—PARTICIPATING AREAS

12.1 Prior to the commencement of production of Unitized Substances, the Unit Operator shall submit for approval by the Supervisor a schedule (or schedules) of all land then regarded as reasonably proved to be productive from a pool or deposit discovered or developed; all lands in said schedule (or schedules), on approval of the Supervisor, will constitute a Participating Area (or Areas) effective as of the date production commences or the effective date of this Unit Agreement, whichever is later. Said schedule (or schedules) shall also set forth the percentage of Unitized Substances to be allocated, as herein provided, to each tract in the Participating Area (or Areas) so established and shall govern the allocation of production commencing with the effective date of the Participating Area.

12.2 A separate Participating Area shall be established for each separate pool or deposit of Unitized Substances or for any group thereof which is produced as a single pool or deposit and any two or more Participating Areas so established may be combined into one, on approval of the Supervisor. The effective date of any Participating Area established after the commencement of actual production of Unitized Substances shall be the first of the month in which is obtained the knowledge or information on which the establishment of said Participating Area is based, unless a more appropriate effective date is proposed by the Unit Operator and approved by the Supervisor.

12.3 Any Participating Area (or Areas) established under 12.1 or 12.2 above shall, subject to the approval of the Supervisor, be revised from time to time to include additional land then regarded as reasonably proved to be productive from the pool or deposit for which the Participating Area was established or to include lands necessary to unit operations, or to exclude land then regarded as reasonably proved not to be productive from the pool or deposit for which the Participating Area was established or to exclude land not necessary to unit operations and the schedule (or schedules) of allocation percentages shall be revised accordingly.

12.4 Subject to the limitation cited in 12.1 hereof, the effective date of any revision of a Participating Area established under Articles 12.1 or 12.2 shall be the first of the month in which is obtained the knowledge or information on which such revision is predicated, provided, however, that a more appropriate effective date may be used if justified by the Unit Operator and approved by the Supervisor.

12.5 No land shall be excluded from a Participating Area on account of depletion of the Unitized Substances, except that any Participating Area established under the provisions of this Article XII shall terminate automatically whenever all operations are abandoned in the pool or deposit for which the Participating Area was established.

12.6 Nothing herein contained shall be construed as requiring any retroactive adjustment for production obtained prior to the effective date of the revision of a Participating Area.

ARTICLE XIII—ALLOCATION OF UNITIZED SUBSTANCES

13.1 All Unitized Substances produced from a Participating Area, established under this Agreement, shall be deemed to be produced equally on an acreage basis from the several tracts of Unitized Land within the

Participating Area established for such production.

13.2 For the purpose of determining any benefits accruing under this Agreement, each Tract of Unitized Land shall have allocated to it such percentage of said production as the number of acres in the Tract included in the Participating Area bears to the total number of acres of Unitized Land in said Participating Area.

13.3 Allocation of production hereunder for purposes other than for settlement of the royalty obligations of the respective Working Interest Owners, shall be on the basis prescribed in the Unit Operating Agreement whether in conformity with the basis of allocation set forth above or otherwise.

13.4 The Unitized Substances produced from a Participating Area shall be allocated as provided herein regardless of whether any wells are drilled on any particular part or tract of said Participating Area.

ARTICLE XIV—RELINQUISHMENT OF LEASES

14.1 Pursuant to the provisions of the Federal leases and 43 CFR 3244.1, a lessee of record shall, subject to the provisions of the Unit Operating Agreement, have the right to relinquish any of its interests in leases committed hereto, in whole or in part; provided, that no relinquishment shall be made of interests in land within a Participating Area without the prior approval of the Director.

14.2 A Working Interest Owner may exercise the right to surrender, when such right is vested in it by any non-Federal lease, sublease, or operating agreement, provided that each party who will or might acquire the Working Interest in such lease by such surrender or by forfeiture is bound by the terms of this Agreement, and further provided that no relinquishment shall be made of such land within a Participating Area without the prior written consent of the non-Federal Lessor.

14.3 If as the result of relinquishment, surrender, or forfeiture the Working Interests become vested in the fee owner or lessor of the Unitized Substances, such owner may:

(1) Accept those Working Interest rights and obligations subject to this Agreement and the Unit Operating Agreement; or

(2) Lease the portion of such land as is included in a Participating Area established hereunder, subject to this Agreement and the Unit Operating Agreement; and provide for the independent operation of any part of such land that is not then included within a Participating Area established hereunder.

14.4 If the fee owner or lessor of the Unitized Substances does not, (1) accept the Working Interest rights and obligations subject to this Agreement and the Unit Operating Agreement, or (2) lease such lands as provided in 14.3 above within six (6) months after the relinquished, surrendered, or forfeited Working Interest becomes vested in said fee owner or lessor, the Working Interest benefits and obligations accruing to such land under this Agreement and the Unit Operating Agreement shall be shared by the owners of the remaining unitized Working Interests in accordance with their respective Working Interest ownerships, and such owners of Working Interests shall compensate the fee owner or lessor of Unitized Substances in such lands by paying sums equal to the rentals, minimum royalties, and royalties applicable to such lands under the lease or leases in effect when the Working Interests were relinquished, surrendered, or forfeited.

14.5 Subject to the provisions of 14.4 above, an appropriate accounting and settlement shall be made for all benefits accruing to or payments and expenditures made or incurred on behalf of any surrendered or forfeited Working Interest subsequent to the date of surrender or forfeiture, and payment of any moneys found to be owing by such an accounting shall be made as between the parties within thirty (30) days.

14.6 In the event no Unit Operating Agreement is in existence and a mutually acceptable agreement cannot be consummated between the proper parties, the Supervisor may prescribe such reasonable and equitable conditions of agreement as he deems warranted under the circumstances.

14.7 The exercise of any right vested in a Working Interest Owner to reassign such Working Interest to the party from whom obtained shall be subject to the same conditions as set forth in this Article XIV in regard to the exercise of a right to surrender.

ARTICLE XV—RENTALS AND MINIMUM ROYALTIES

15.1 Any unitized lease on non-Federal land containing provisions which would terminate such lease unless drilling operations are commenced upon the land covered thereby within the time therein specified or rentals are paid for the privilege of deferring such drilling operations, the rentals required thereby shall, notwithstanding any other provisions of this Agreement, be deemed to accrue as to the portion of the lease not included within a Participating Area and become payable during the term thereof as extended by this Agreement, and until the required drillings are commenced upon the land covered thereby.

15.2 Rentals are payable on Federal leases on or before the anniversary date of each lease year; minimum royalties accrue from the anniversary date of each lease year and are payable at the end of the lease year.

15.3 Beginning with the lease year commencing on or after _____ and for each lease year thereafter, rental or minimum royalty for lands of the United States subject to this Agreement shall be made on the following basis:

(a) An advance annual rental in the amount prescribed in unitized Federal leases, in no event creditable against production royalties, shall be paid for each acre or fraction thereof which is not within a Participating Area.

(b) A minimum royalty shall be charged at the beginning of each lease year (such minimum royalty to be due as of the last day of the lease year and payable within thirty (30) days thereafter) of $2 an acre or fraction thereof, for all Unitized Acreage within a Participating Area as of the beginning of the lease year. If there is production during the lease year the deficit, if any, between the actual royalty paid and the minimum royalty prescribed herein shall be paid.

15.4 Rental or minimum royalties due on leases committed hereto shall be paid by Working Interest Owners responsible therefor under existing contracts, laws, and regulations, or by the Unit Operator.

15.5 Settlement for royalty interest shall be made by Working Interest Owners responsible therefor under existing contracts, laws, and regulations, or by the Unit Operator, on or before the last day of each month for Unitized Substances produced during the preceding calendar month.

15.6 Royalty due the United States shall be computed as provided in the operating regulations and paid in value as to all Unitized Substances on the basis of the amounts thereof allocated to unitized Federal land as provided herein at the royalty rate or rates specified in the respective Federal leases.

15.7 Nothing herein contained shall operate to relieve the lessees of any land from their respective lease obligations for the payment of any rental, minimum royalty, or royalty due under their leases.

ARTICLE XVI—OPERATIONS ON NONPARTICIPATING LAND

16.1 Any party hereto owning or controlling the Working Interest in any Unitized Land having thereon a regular well location may, with the approval of the Supervisor and at such party's sole risk, costs, and expense, drill a well to test any formation of deposit for which a Participating Area has not been established or to test any formation or deposit for which a Participating Area has been established if such location is not within said Participating Area, unless within 30 days of receipt of notice from said party of his intention to drill the well, the Unit Operator elects and commences to drill such a well in like manner as other wells are drilled by the Unit Operator under this Agreement.

16.2 If any well drilled by a Working Interest Owner other than the Unit Operator proves that the land upon which said well is situated may properly be included in a Participating Area, such Participating Area shall be established or enlarged as provided in this Agreement and the well shall thereafter be operated by the Unit Operator in accordance with the terms of this Agreement and the Unit Operating Agreement.

ARTICLE XVII—LEASES AND CONTRACTS CONFORMED AND EXTENDED

17.1 The terms, conditions, and provisions of all leases, subleases, and other contracts relating to exploration, drilling, development, or utilization of geothermal resources on lands committed to this Agreement, are hereby expressly modified and amended only to the extent necessary to make the same conform to the provisions hereof, otherwise said leases, subleases, and contracts shall remain in full force and effect.

17.2 The parties hereto consent that the Secretary shall, by his approval hereof, modify and amend the Federal leases committed hereto and the regulations in respect thereto to the extent necessary to conform said leases and regulations to the provisions of this Agreement.

17.3 The development and/or operation of lands subject to this Agreement under the terms hereof shall be deemed full performance of any obligations for development and operation with respect to each and every separately owned tract subject to this Agreement, regardless of whether there is any development of any particular tract of the Unit Area.

17.4 Drilling and/or producing operations performed hereunder upon any tract of Unitized Lands will be accepted and deemed to be performed upon and for the benefit of each and every tract of Unitized Land.

17.5 Suspension of operations and/or production on all Unitized Lands pursuant to direction or consent of the Secretary or his duly authorized representative shall be deemed to constitute such suspension pursuant to such direction or consent as to each and every tract of Unitized Land. A suspension of operations and/or production limited to specified lands shall be applicable only to such lands.

17.6 Subject to the provisions of Article XV hereof and 17.10 of this Article, each lease, sublease, or contract relating to the exploration, drilling, development, or utilization of geothermal resources of lands other than those of the United States committed to this Agreement, is hereby extended beyond any such term so provided therein so that it shall be continued for and during the term of this Agreement.

17.7 Subject to the lease renewal and the readjustment provision of the Act, any Federal lease committed hereto may, as to the Unitized Lands, be continued for the term

so provided therein, or as extended by law. This subsection shall not operate to extend any lease or portion thereof as to lands excluded from the Unit Area by the contraction thereof.

17.8 Each sublease or contract relating to the operations and development of Unitized Substances from lands of the United States committed to this Agreement shall be continued in force and effect for and during the term of the underlying lease.

17.9 Any Federal lease heretofore or hereafter committed to any such unit plan embracing lands that are in part within and in part outside of the area covered by any such plan shall be segregated into separate leases as to the lands committed and the lands not committed as of the effective date of unitization.

17.10 In the absence of any specific lease provision to the contrary, any lease, other than a Federal lease, having only a portion of its land committed hereto shall be segregated as to the portion committed and the portion not committed, and the provisions of such lease shall apply separately to such segregated portions commencing as of the effective date hereof. In the event any such lease provides for a lump-sum rental payment, such payment shall be prorated between the portions so segregated in proportion to the acreage of the respective tracts.

17.11 Upon termination of this Agreement, the leases covered hereby may be maintained and continued in force and effect in accordance with the terms, provisions, and conditions of the Act, the lease or leases, and amendments thereto.

ARTICLE XVIII—EFFECTIVE DATE AND TERM

18.1 This Agreement shall become effective upon approval by the Secretary or his duly authorized representative and shall terminate five (5) years from said effective date unless,

(a) Such date of expiration is extended by the Director, or

(b) Unitized Substances are produced or utilized in commercial quantities in which event this Agreement shall continue for so long as Unitized Substances are produced or utilized in commercial quantities, or

(c) This Agreement is terminated prior to the end of said five (5) year period as heretofore provided.

18.2 This Agreement may be terminated at any time by the owners of a majority of the Working Interests, on an acreage basis, with the approval of the Supervisor. Notice of any such approval shall be given by the Unit Operator to all parties hereto.

ARTICLE XIX—APPEARANCES

19.1 Unit Operator shall, after notice to other parties affected, have the right to appear for and on behalf of any and all interests affected hereby before the Department of the Interior, and to appeal from decisions, orders or rulings issued under the regulations of said Department, or to apply for relief from any of said regulations or in any proceedings relative to operations before the Department of the Interior or any other legally constituted authority: *Provided, however,* That any interested parties shall also have the right, at its own expenses, to be heard in any such proceeding.

ARTICLE XX—NO WAIVER OF CERTAIN RIGHTS

20.1 Nothing contained in this Agreement shall be construed as a waiver by any party hereto of the right to assert any legal or constitutional right or defense pertaining to the validity or invalidity of any law of the State wherein lands subject to this Agreement are located, or of the United States, or regulations issued thereunder, in any way affecting such party or as a waiver by any such party of any right beyond his or its authority to waive.

ARTICLE XXI—UNAVOIDABLE DELAY

21.1 The obligations imposed by this Agreement requiring Unit Operator to commence or continue drilling or to produce or utilize Unitized Substances from any of the land covered by this Agreement, shall be suspended while, but only so long as, Unit Operator, despite the exercise of due care and diligence, is prevented from complying with such obligations, in whole or in part, by strikes, Acts of God, Federal or other applicable law, Federal or other authorized governmental agencies, unavoidable accidents, uncontrollable delays in transportation, inability to obtain necessary materials in open market, or other matters beyond the reasonable control of Unit Operator, whether similar to matters herein enumerated or not.

21.2 No unit obligation which is suspended under this section shall become due less than thirty (30) days after it has been determined that the suspension is no longer applicable.

21.3 Determination of creditable "Unavoidable Delay" time shall be made by the Unit Operator subject to approval of the Supervisor.

ARTICLE XXII—POSTPONEMENT OF OBLIGATIONS

22.1 Notwithstanding any other provisions of this Agreement, the Director, on his own initiative or upon appropriate justification by Unit Operator, may postpone any obligation established by and under this Agreement to commence or continue drilling or to operate on or produce Unitized Substances from lands covered by this Agreement when in his judgement, circumstances warrant such action.

ARTICLE XXIII—NONDISCRIMINATION

23.1 In connection with the performance of work under this Agreement, the Operator agrees to comply with all of the provisions of section 202 (1) to (7) inclusive, of Executive Order 11246 (30 F.R. 12319), as amended by Executive Order 11375 (32 F.R. 14303), which are hereby incorporated by reference in this Agreement.

ARTICLE XXIV—COUNTERPARTS

24.1 This Agreement may be executed in any number of counterparts no one of which needs to be executed by all parties, or may be ratified or consented to by separate instruments in writing specifically referring hereto, and shall be binding upon all parties who have executed such a counterpart, ratification or consent hereto, with the same force and effect as if all such parties had signed the same document.

ARTICLE XXV—SUBSEQUENT JOINDER

25.1 If the owner of any substantial interest in geothermal resources under a tract within the Unit Area fails or refuses to subscribe or consent to this Agreement, the owner of the Working Interest in that tract may withdraw said tract from this Agreement by written notice delivered to the Supervisor and the Unit Operator prior to the approval of this Agreement by the Supervisor.

25.2 Any geothermal resources interests in lands within the Unit Area not committed hereto prior to approval of this Agreement may thereafter be committed by the owner or owners thereof subscribing or consenting to this Agreement, and, if the interest is a Working Interest, by the owner of such interest also subscribing to the Unit Operating Agreement.

25.3 After operations are commenced hereunder, the right of subsequent joinder, as provided in this Article XXV, by a working Interest Owner is subject to such requirements or approvals, if any, pertaining to such joinder, as may be provided for in the Unit Operating Agreement. Joinder to the Unit Agreement by a Working Interest Owner, at any time, must be accompanied by appropriate joinder to the Unit Operating Agreement, if more than one committed Working Interest Owner is involved, in order for the interest to be regarded as committed to this Unit Agreement.

25.4 After final approval hereof, joinder by a nonworking interest owner must be consented to in writing by the Working Interest Owner committed hereto and responsible for the payment of any benefits that may accrue hereunder in behalf of such nonworking interest. A nonworking interest may not be committed to this Agreement unless the corresponding Working Interest is committed hereto.

25.5 Except as may otherwise herein be provided, subsequent joinders to this Agreement shall be effective as of the first day of the month following the filing with the Supervisor of duly executed counterparts of all or any papers necessary to establish effective commitment of any tract to this Agreement unless objection to such joinder is duly made within sixty (60) days by the Supervisor.

ARTICLE XXVI—COVENANTS RUN WITH THE LAND

26.1 The covenants herein shall be construed to be covenants running with the land with respect to the interest of the parties hereto and their successors in interest until this Agreement terminates, and any grant, transfer, or conveyance, of interest in land or leases subject hereto shall be and hereby is conditioned upon the assumption of all privileges and obligations hereunder by the grantee, transferee, or other successor in interest.

26.2 No assignment or transfer of any Working Interest or other interest subject hereto shall be binding upon Unit Operator until the first day of the calendar month after Unit Operator is furnished with the original, photostatic, or certified copy of the instrument of transfer.

ARTICLE XXVII—NOTICES

27.1 All notices, demands or statements required hereunder to be given or rendered to the parties hereto shall be deemed fully given if given in writing and personally delivered to the party or sent by postpaid registered or certified mail, addressed to such party or parties at their respective addresses set forth in connection with the signatures hereto or to the ratification or consent hereof or to such other address as any such party may have furnished in writing to party sending the notice, demand or statement.

ARTICLE XXVIII—LOSS OF TITLE

28.1 In the event title to any tract of Unitized Land shall fail and the true owner cannot be induced to join in this Agreement, such tract shall be automatically regarded as not committed hereto and there shall be such readjustment of future costs and benefits as may be required on account of the loss of such title.

28.2 In the event of a dispute as to title as to any royalty, Working Interest, or other interests subject hereto, payment or delivery on account thereof may be withheld without liability for interest until the dispute is finally settled: *Provided,* That, as to Federal land or leases, no payments of funds due the United States shall be withheld, but such funds shall be deposited as directed by the Supervisor to be held as unearned money

pending final settlement of the title dispute, and then applied as earned or returned in accordance with such final settlement.

ARTICLE XXIX—TAXES

29.1 The Working Interest Owners shall render and pay for their accounts and the accounts of the owners of nonworking interests all valid taxes on or measured by the Unitized Substances in and under or that may be produced, gathered, and sold or utilized from the land subject to this Agreement after the effective date hereof.

29.2 The Working Interest Owners on each tract may charge a proper proportion of the taxes paid under 29.1 hereof to the owners of nonworking interests in said tract, and may reduce the allocated share of each royalty owner for taxes so paid. No taxes shall be charged to the United States or the State of _____ or to any lessor who has a contract with his lessee which requires the lessee to pay such taxes.

ARTICLE XXX—RELATION OF PARTIES

30.1 It is expressly agreed that the relation of the parties hereto is that of independent contractors and nothing in this Agreement contained, expressed, or implied, nor any operations conducted hereunder, shall create or be deemed to have created a partnership or association between the parties hereto or any of them.

ARTICLE XXXI—SPECIAL FEDERAL LEASE STIPULATIONS AND/OR CONDITIONS

31.1 Nothing in this Agreement shall modify special lease stipulations and/or conditions applicable to lands of the United States. No modification of the conditions necessary to protect the lands or functions of lands under the jurisdiction of any Federal agency is authorized except with prior consent in writing whereby the authorizing official specifies the modification permitted.

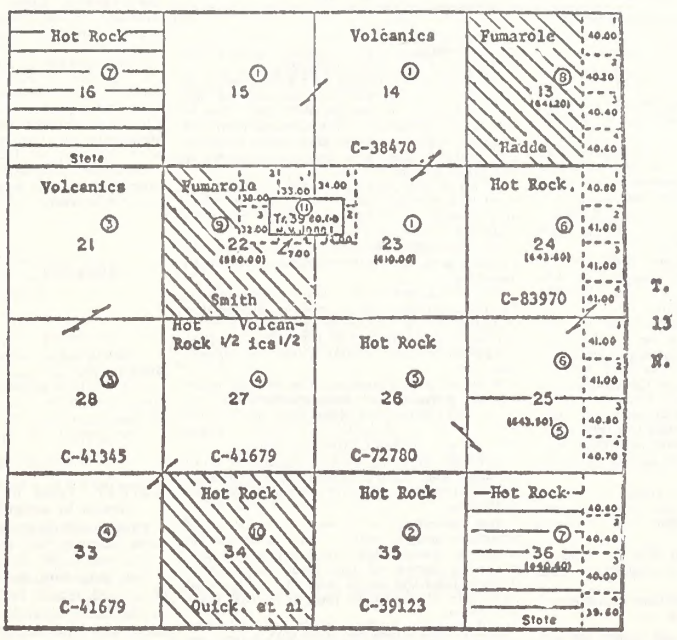
In witness whereof, the parties hereto have caused this Agreement to be executed and have set opposite their respective names the date of execution.

Witnesses:
_____
_____
Witnesses:
_____
_____
Witnesses:
_____
_____

Unit operator (as unit operator and as working interest owner)
_____
By _____
Working Interest Owners:
_____
By _____
Other Interest Owners:
_____
By _____

§ 271.13 Sample form of Exhibit A of unit agreement.

EXHIBIT A—BIG VAPOR UNIT AREA, T. 13 N., R. 10 W., M.D.M., California
R. 1 W.



① Means tract number as listed on Exhibit B

PUBLIC LAND

STATE LAND

PATENTED LAND

§ 271.14 Sample form of Exhibit B of unit agreement.

EXHIBIT B—BIG VAPOR UNIT AREA, NAPA COUNTY, CALIF., T. 18 N., R. 10 W.

Tract No.	Description of land	No. of acres	Serial No. and expiration date of lease	Basic royalty and ownership percentage	Lessee of record	Working interest and percentage
	Federal land		*California serials*			
1	Sec. 14: All.... Sec. 15: All. Sec. 23: Lots 1, 2, 8½, NE¼, E½NW¼.	1,890.00	38470 July 31, 1982.	United States: All...	Volcanics, Inc.....	Volcanics, Inc: All.
2	Sec. 35: All....	640.00	39123 July 31, 1982.	do.....	D. H. Boller.....	Hot Rock Co.: All.
3	Sec. 21: All.... Sec. 28: All.	1,280.00	41345 July 31, 1982.	do.....	C. S. Waters—50%... D. F. Mann—50%...	Volcanics, Co.: 50%. Hot Rock Co.: 50%.
4	Sec. 27: All.... Sec. 33: All.	1,280.00	41679	do.....	H. C. Pipes.....	Fumarole Ltd.: All.
5	Sec. 26: All.... Sec. 25: S½.	961.50	71278 Sept. 31, 1982.	do.....	Hot Rock Co.....	Hot Rock Co.: All.
6	Sec. 24: All.... Sec. 25: N½.	955.80	83970 Application.	do.....	H. C. Pipes.....	Do.
	6 Federal tracts 7,017.30 acres or 68.47% of unit area.					
	California State land					
7	Sec. 16: All.... Sec. 36: All.	1,280.60	65-67430.....	State of California: All.	Hot Rock Co.....	Hot Rock Co.: All.
	1 State tract 1,280.60 acres or 12.49% of unit area.					
	Patented land					
8	Sec. 13: All....	641.20	June 30, 1979..	I. B. Hadde: All....	Fumarole, Ltd.....	Fumarole, Ltd.: All.
9	Sec. 22: Lots 1, 2, 3, 4, 8¼, NW¼.	560.00	Feb. 28, 1981..	J. P. Smith: All.....	do.....	Do.
10	Sec. 34: All....	640.00	Mar. 31, 1981..	A. G. Quick: 75%... P. T. Land: 25%.	Hot Rock Co.....	Hot Rock Co.: All.
11	Tract 39.....	80.00	Apr. 30, 1981..	M. V. Jones: All....	Unleased.....	M. V. Jones: All.
	3 Patented tracts 1,961.20 acres or 19.04% of unit area.					
	Total.. 11 tracts 10,249.10 acres in entire unit area.					

§ 271.15 Form of collective bond.

COLLECTIVE CORPORATE SURETY

Known all men by these presents, That we, _____ signing as Principal
(Name of Unit Operator)
pal, for and on behalf of the record owners of unitized substances now or hereafter covered by the unit agreement for this _____, approved _____,
(Name of Unit) (Date)
_____, as Surety are
(Name and address of Surety)
jointly and severally held and firmly bound unto the United States of America in the sum of _____ Dollars,
(Amount of bond)
lawful money of the United States, for the use and benefit of and to be paid to the United States and any entryman or patentee of any portion of the unitized land, heretofore entered or patented with the reservation of the geothermal resources deposits to the United States, for which payment well and truly to be made, we bind ourselves, and each of us, and each of our heirs, executors, administrators, successors, and assigns by these presents.

The condition of the foregoing obligation is such that, whereas the Secretary on _____ approved under the provisions
(Date)
of the Geothermal Steam Act of 1970, a unit agreement for the development and operation of the _____;
(Name of Unit and State)
and

Whereas said Principal and record owners of unitized substances, pursuant to said unit agreement, have entered into certain covenants and agreements as set forth therein, under which operations are to be conducted; and

Whereas said Principal as Unit Operator has assumed the duties and obligations of the respective owners of unitized substances as defined in said unit agreement; and

Whereas said Principal and surety agree to remain bound in the full amount of the bond for failure to comply with the terms of the unit agreement, and the payment of rentals, minimum royalties, and royalties due under the Federal leases committed to said unit agreement; and

Whereas the Surety hereby waives any right of notice of and agrees that this bond may remain in force and effect notwithstanding:

(a) Any additions to or change in the ownership of the unitized substances herein described.

(b) Any suspension of the drilling or producing requirements or waiver, suspension or reduction of rental or minimum royalty payments or reduction of royalties pureuant to applicable laws or regulations thereunder; and

Whereas said Principal and Surety agree to the payment of compensatory royalty under the regulations of the Interior Department in lieu of drilling necessary offset wells in the event of drianage; and

Whereas nothing herein contained shall preclude the United States from requiring an additional bond at any time when deemed necessary:

Now, therefore, if the said Principal shall faithfully comply with all of the provisions of the above-identified unit agreement and with the terms of the leases committed thereto, then the above obligation is to be of no effect; otherwise to remain in full force and virtue.

Signed, sealed, and delivered this _____ day of _____, 19____, in the presence of:
Witnesses:

_____ _____
(Principal)

_____ _____
(Surety)

§ 271.16 Form of designation of successor unit operator by working interest owners.

Designation of successor Unit Operator _____, Unit Area, County of _____ State of _____, No. _____.

This indenture, dated as of the _____ day of _____, 19____, by and between _____ hereinafter designated as "First Party," and the owners of unitized working interest, hereinafter designated as "Second Parties."

Witnesseth: Whereas under the provisions of the Geothermal Steam Act of December 24, 1970, 84 Stat. 1566, the Secretary on the _____ day of _____, 19____, approved a unit agreement for the _____ Unit Area, wherein _____ is designated as Unit Operator; and

Whereas said _____ has resigned as such Operator,[1] and the designation of a successor Unit Operator is now required pursuant to the terms thereof; and

Whereas First Party has heen and herehy is designated by Second Parties as a Unit Operator, and said First Party desires to assume all the rights, duties, and ohligations of Unit Operator under the said unit agreement.

Now, therefore, in consideration of the premises hereinhefore set forth and the promises hereinafter stated, the First Party herehy covenants and agrees to fulfill the duties and assume the ohligations of Unit Operator under and pursuant to all the terms of the _____ unit agreement, and the Second Parties covenant and agree that, effective upon approval of this idenlure hy the Supervisor, of the Geological Survey, First Party shall be granted the exclusive right and privilege of exercising any and all rights and privileges and Unit Operator, pursuant to the terms and conditions of said unit agreement; said unit agreement being hereby incorporated herein hy references and made a part hereof as fully and effectively as though said unit agreement were expressly set forth in this instrument.

In witness whereof, the parties hereto have executed this instrument as of the date hereinahove set forth.

_____ _____
(First Party)
_____
(Witnesses)

_____ _____
(Second Party)
_____
(Witnesses)

I hereby approve the foregoing indenture designating _____ as Unit Operator under the unit agreement for the _____ Unit Area, this _____ day of _____, 19____.

_____
Supervisor,
U.S. Geological Survey.

§ 271.17 Form of change in unit operator by assignment.

Change in Unit Operator _____ unit Area, County of _____, State of _____, No. _____.

This indenture, dated as of the _____ day of _____, 19____, hy and between _____ hereinafter designated as "First Party," and _____, hereinafter designated as "Second Party."

[1] Where the designation of a successor Unit Operator is required for any reason other than resignation, euch reason shall be substituted for ths one stated.

Witnesseth: Whereas under the provisions of the Geothermal Steam Act of December 24, 1970, 84 Stat. 1566, the Secretary on the ------ day of ----------, 19----, approved a unit agreement for the ---------- Unit Area, wherein the First Party is designated as Unit Operator; and

Whereas the First Party desires to transfer, assign, release, and quitclaim, and the Second Party desires to assume all the rights, duties, and obligations of Unit Operator under the unit agreement; and

Whereas for sufficient and valuable consideration, the receipt whereof is hereby acknowledged, the First Party has transferred, conveyed and assigned all his/its rights under certain operating agreements involving lands within the area set forth in said unit agreement unto the Second Party:

Now, therefore, in consideration of the premises hereinbefore set forth, the First Party does hereby transfer, assign, release, and quitclaim unto Second Party all of First Party's rights, duties and obligations as Unit Operator under said unit agreement; and

Second Party hereby accept this assignment and hereby convenants and agrees to fulfill the duties and assume the obligations of Unit Operator under and pursuant to all the terms of said unit agreement to the full extent set forth in this assignment, effective upon approval of this indenture by the Supervisor of the Geological Survey; said unit agreement being hereby incorporated herein by reference and made a part hereof as fully and effectively as though said unit agreement were expressly set forth in this instrument.

In witness whereof, the parties hereto have executed this instrument as of the date hereinabove set forth.

---------- ----------
(First Party)

(Witnessee)

---------- ----------
(Second Party)

(Witnesses)

I hereby approve the foregoing indenture designated ---------- as Unit Operator under the unit agreement for the ---------- Unit Area, this ------ day of ----------, 19----.

Supervisor, U.S.
Geological Survey

Dated: December 17, 1973.

W. W. LYONS,
Deputy Under Secretary of the Interior.

[FR Doc.73-26891 Filed 12-20-73;8:45 am]

CHAPTER II—BUREAU OF LAND MANAGEMENT, DEPARTMENT OF THE INTERIOR

GEOTHERMAL RESOURCES

Leasing on Public, Acquired and Withdrawn Lands

The purpose of these regulations is to implement the Geothermal Steam Act of 1970 (30 U.S.C. 1001–1025) and provide for the leasing of the public and acquired lands of the United States for the purpose of geothermal resources exploration, development, and production.

The public was afforded an opportunity to comment on proposed rulemaking published on July 23, 1971, November 29, 1972, and July 23, 1973 and supplemented on August 8, 1973. These regulations reflect consideration of all comments received on the published proposed rulemaking.

A Final Environmental Statement, prepared in accordance with the provisions of section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(C)), was issued on October 23, 1973. It discussed the environmental impact of leasing federally owned geothermal resources under the proposed rulemaking, and proposed provisions for inclusion in regulations and leases to mitigate any possible impacts on the environment.

These regulations will be effective January 1, 1974.

PART 3000—MINERALS MANAGEMENT; GENERAL

1. Section 3000.0–5 of Subpart 3000, Chapter II, Title 43 of the Code of Federal Regulations is revised to read as follows:

§ 3000.0–5 Definitions.

As used in this subchapter:

(a) "Leasable minerals" means oil and gas. (1) Gas means any fluid, either combustible or noncombustible, which is produced in a natural state from the earth and which maintains a gaseous or rarefied state at ordinary temperature and pressure conditions. (2) Oil or crude oil means any liquid hydrocarbon substance which occurs naturally in the earth, including drip gasoline or other natural condensates recovered from gas, without resort to manufacturing process.

(b) "Other leasable minerals" means (1) Coal, chlorides, sulphates, carbonates, borates, silicates, or nitrates of potassium and sodium; sulphur in the States of Louisiana and New Mexico; phosphate; and native asphalt, solid and semisolid bitumen and bituminous rock (including oil impregnated rock or sands from which oil is recoverable only by special treatment after the deposit is mined or quarried); (2) solid (hardrock) minerals; minerals in acquired lands which would be subject to location under the U.S. mining laws if located in the public domain lands.

(c) "Secretary" means the Secretary of the Interior or any person duly authorized to exercise the powers vested in that officer.

(d) "Director" means the Director of the Bureau of Land Management or any person duly authorized to exercise the powers vested in that officer.

(e) "State Director" means the Director of a Bureau of Land Management State office or any person duly authorized to exercise the powers vested in that officer.

(f) "Authorized officer" means any person authorized by law or by lawful delegation of authority in the Bureau of Land Management to perform the duties described.

(g) "Proper BLM office" means the Bureau of Land Management office having jurisdiction over the lands subject to the regulation where the term is used.

(h) "Public domain lands" means original public domain lands which have never left Federal ownership; also, lands in Federal ownership which were obtained by the Government in exchange for public lands or for timber on such lands; also original public domain lands which have reverted to Federal ownership through operation of the public land laws.

(i) "Acquired lands" means lands which the United States obtains by deed through purchase or gift, or through condemnation proceedings. They are distinguished from public domain lands in that acquired lands may or may not have been originally owned by the Government. If originally owned by the Government such lands have been disposed of (patented) under the public land laws and thereafter reacquired by the United States.

(j) "Other lands" means (1) "Withdrawn lands." Lands which have been withdrawn and dedicated to public purposes. (2) "Reserved lands." Lands which have been withdrawn from disposal and dedicated to a specific public purpose. (3) "Segregated lands." Lands included in a withdrawal, or in an application or entry or in a proper classification which segregates them from operation of the public land laws.

2. Section 3000.4 of Subpart 3000, Chapter II, Title 43 of the Code of Federal Regulations is revised to read as follows:

§ 3000.4 Appeals.

Any party to a case who is adversely affected by any official action or decision of an officer of the Bureau of Land Management or of an Administrative Law Judge of the Office of Hearings and Appeals, Office of the Secretary, except a decision which has been approved by the Secretary, shall have a right of appeal to the Board of Land Appeals in the Office of Hearings and Appeals, Office of the Secretary. All appeals shall be governed by the rules of practice in Subpart E of Part 4 of this title. Nothing in this group shall be construed to prevent any interested party from seeking judicial review as authorized by law.

3. A new Group 3200 is added to Chapter II, Title 43 of the Code of Federal Regulations to read as follows:

Group 3200—Geothermal Resources Leasing

PART 3200—GEOTHERMAL RESOURCES LEASING; GENERAL

Subpart 3200—Geothermal Resources Leasing; General

Subpart 3201—Available Lands; Limitations; Unit Agreements

Subpart 3200—Geothermal Resources Leasing; General

§ 3200.0–3 Authority.

These regulations are issued pursuant to the Geothermal Steam Act of 1970 (84 Stat. 1566; 30 U.S.C. 1001–1025) and rights to develop and utilize geothermal resources in land subject to these regulations may be acquired only in accordance with these regulations.

§ 3200.0–5 Definitions.

As used in Group 3200, the term:

(a) "The Act" means the Geothermal Steam Act of 1970.

(b) "Geothermal lease" means a lease issued under authority of the Act; and unless the context indicates otherwise, "lease" means a "geothermal lease".

(c) "Geothermal resources" means geothermal steam and associated geothermal resources which include: (1) All products of geothermal processes, embracing indigenous steam, hot water and hot brines; (2) steam and other gases, hot water and hot brines resulting from water, gas, or other fluids artificially introduced into geothermal formations; (3) heat or other associated energy found in geothermal formations; and (4) any byproducts derived from them.

(d) "Byproduct" means (1) any mineral or minerals (exclusive of oil, hydrocarbon gas, and helium) which are found in solution or in association with geothermal steam and which have a value of less than 75 per centum of the value of the geothermal steam or are not, because of quantity, quality, or technical difficulties in extraction and production, of sufficient value to warrant extraction and production by themselves, and (2) commercially demineralized water.

(e) "Sole party in interest" means a party who is and will be vested with all legal and equitable rights under the lease. No one is, or shall be deemed to be, a sole party in interest with respect to a lease in which any other party has any interest in the lease.

(f) "Interest in the lease" means any interest whatever in a geothermal lease, including, but not limited to: A record title interest; a working interest; an operating right; an overriding royalty interest; a claim to any prospective or future advantage or benefit from a lease; a participation in any increment, issue, or profit which may be derived, or accrue in any manner, from the lease based upon, or pursuant to, any agreement or understanding in existence at the time when the offer is filed; and an agreement pertaining to any of the foregoing.

(g) "Supervisor" means a representative of the Secretary, subject to the direction and supervision of the Director, the Chief, Conservation Division, Geological Survey and the appropriate Regional Conservation Manager, Conservation Division, Geological Survey, authorized and empowered to regulate operations and to perform other duties prescribed in the regulations in this part or any subordinate of such representative acting under his direction.

(h) "Primary term" means the first 10 years in the life of the lease, exclusive of any period of suspension of operations or production, or both.

(i) "Area of operation" means that area of the leased lands which is required for exploration, development and producing operations, and which is delineated on a map or plat which is made a part of the approved plan of operations. It encompasses the area generally needed for wells, flow lines, separators, surge tanks, drill pads, mud pits, workshops, and other such facilities used for on-project geothermal resources field exploration, development and production operations.

(j) "Commercial quantities" means quantities sufficient to provide a return after all variable costs of production have been met.

(k) "Known geothermal resource area" or "KGRA" means an area in which the geology, nearby discoveries, competitive interests, or other indicia would, in the opinion of the Secretary, engender a belief in men who are experienced in the subject matter that the prospects for extraction of geothermal steam or associated geothermal resources are good enough to warrant expenditures of money for that purpose.

(l) In determining whether the geology of an area is of such a nature that the area should be designated a KGRA the Director, Geological Survey, acting for the Secretary, shall use such geologic and technical evidence as he shall deem appropriate, including the following:

(i) The existence of siliceous sinter and natural geysers;

(ii) The temperatures of fumaroles, thermal springs, and mud volcanoes;

(iii) The SiO_2 content of spring water;

(iv) The Na/K ratio in spring waters of hot-water systems;

(v) The existence of volcanoes and calderas of late Teirtary or Quaternary age;

(vi) Conductive heat flows and geothermal gradient;

(vii) The porosity and the permeability of a potential reservoir;

(viii) The results of electrical resistivity surveys;

(ix) The results of magnetic, gravity, and airborne infrared geophysical surveys; and

(x) The information obtained through other geophysical methods such as microseismic, seismic ground noise, electromagnetic, and telluric surveys if such methods prove to have significant use in evaluation.

(2) For purposes of KGRA classification, a "discovery" or "discoveries" will be considered to be any well deemed by the Director, Geological Survey, to be capable of producing geothermal resources in commercial quantities and, where the geological structure is not known, "nearby" will be considered to be five miles or less from any such discovery. Lands nearby a discovery will be classified as KGRA unless the Geological Survey determines that the lands are on a different geologic structure from the discovery. Where the Geological Survey has determined the extent of a structure on which a discovery has been made, all land in that structural area contributing geothermal resources to that discovery will be deemed a KGRA regardless of the distance from the discovery.

(3) "Competitive interest" shall exist in the entire area covered by an application for a geothermal lease if at least one-half of the lands covered by that application are also covered by another application which was filed during the same application filing period, whether or not that other application is subsequently withdrawn or rejected. Competitive interest shall not be deemed to exist in the entire area covered by an application because of an overlapping application, if less than one-half of the lands subject to the first application are covered by any other single application filed during the same application filing period; however, some of the lands subject to the first application may be determined to be within a KGRA pursuant to the first sentence of this subparagraph (3).

(l) "Primarily valuable" means the principal mineral value for which the leasehold is being produced.

§ 3200.0–6 Preleasing procedures.

(a) When an area is initially considered for geothermal leasing or when the need arises, the Director shall request other interested Bureaus and Federal agencies to prepare reports describing, to the extent known, resources contained within the general area and the potential effect of geothermal resources operations upon the resources of the area and its total environment. If the Director determines that the issuance of leases in an area would be a major Federal action significantly affecting the quality of the human environment, he shall issue no leases in that area unless an environmental impact statement under section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(C)) has been issued.

(b) Prior to the final selection of tracts for leasing, the Director, or the head of the agency charged with the administration of the surface, if that officer so elects, shall, when appropriate, evaluate fully the potential effect of the geothermal resources operations pursuant to a leasing program on the total environment, fish and other aquatic resources, wildlife habitat and populations, aesthetics, recreation, and other resources in the entire area during exploratory, developmental, and operational phases. This evaluation will consider the potential impact of the possible development and utilization of the geothermal resources including the construction of power generating plants and transmission facilities on lands which may or may not be included in a geothermal lease. To aid him in his evaluation and selection of tracts the Director shall request and consider the views and recommendations of appropriate Federal agencies, may hold public hearings after appropriate notice, and shall, as appropriate, consult with State agencies, organizations, industries, and lease applicants, and shall consider all other potential factors, such as use of the land and its natural resources, the need for the energy mineral deposits, and socio-economic conditions consistent with multiple-use management principles. If a decision is made to lease, the Director shall develop special terms and conditions to be included in leases as required to protect the environment, to permit use of the land for other purposes, and to protect other natural resources. If tracts are offered for competitive leasing, the notice announcing the availability of the land for leasing will specify the proper BLM office where all terms and conditions to be included in leases for such tracts are available.

§ 3200.0–7 Cross reference.

(a) The regulations governing operations under geothermal leases are found in 30 CFR Part 270 .

(b) The regulations setting forth the basic policies for management of the public lands are found in Part 1725 of this chapter.

§ 3200.0–8 Use of surface.

(a) A lessee shall be entitled to use for the production, utilization, and conservation of geothermal resources only so much of the surface of the leased Federal lands as is deemed necessary for such purposes. The lessee shall have the right to use so much of the leased lands as may be deemed necessary for a power generation plant or a commercial or industrial facility, and may apply for the right to use so much of other Federal lands as may be deemed necessary for such purposes; however, any use of the leased lands or other Federal lands for a power generation plant or a commercial or industrial facility will be authorized only under a separate permit issued by the appropriate agency for that specific use and subject to all terms and conditions which it may include in that permit. The uses of the lands within the area of operation are subject to the supervision of the supervisor, and the uses of the remaining leased lands or other Federal lands are subject to the supervision of the appropriate surface management agency. The lessee shall not be entitled to use any mineral materials subject to the Materials Act except as provided by Part 3600 of this chapter.

(b) Operations under other leases or uses on the same lands shall not unreasonably interfere with or endanger operations under leases issued under these regulations nor shall operations under these regulations unreasonably interfere with or endanger operations under any lease, license, claim, permit, or other authorized use pursuant to the provisions of any other Act.

Subpart 3201—Available Lands; Limitations, Unit Agreements

§ 3201.1 Lands subject to geothermal leasing.

§ 3201.1–1 General.

Subject to the exceptions listed below, geothermal leases may be issued in combination or separately for (a) lands administered by the Secretary of the Interior; (b) national forest lands or other lands administered by the Department of Agriculture through the Forest Service; and (c) geothermal resources in lands which have been conveyed by the United States subject to a reservation to the United States of geothermal resources.

§ 3201.1–2 Department of the Interior.

(a) Except as provided in this section, leases may be issued in accordance with the regulations in this part for withdrawn lands, for acquired lands, and for geothermal resources in lands which have passed from Federal ownership subject to a reservation to the United States of the geothermal resources therein where such lands or resources are administered by the Secretary of the Interior.

(b) Notwithstanding any other provision in these regulations, geothermal leases shall not be issued for: (1) Lands which the Secretary has identified or may identify as being necessary to the performance of his or any other Federal officer's authorized functions, and on which geothermal resource development would in his judgment interfere with such functions; or (2) lands respecting which the Secretary has made or may make a finding that the issuance of geothermal leases would be contrary to the public interest. Upon receipt of an application for a geothermal lease affecting lands withdrawn under section 3 of the Reclamation Act of 1902 (43 U.S.C. 416) or any other appropriate authority, notice thereof and an opportunity to comment thereon shall be given to the head of the agency for whose benefit the withdrawal was made. No geothermal lease affecting lands withdrawn for any agency outside the Department of the Interior shall be leased without the consent of the head of the agency for which the lands are withdrawn. Where leases are issued under Part 3210 of this chapter or 3220 for lands neighboring such reserved lands, the lessees shall be required

to perform such lease operations and take such measures as are prescribed by the Secretary for the protection of the Federal interests therein.

§ 3201.1–3 Department of Agriculture.

Leases for public, withdrawn or acquired lands administered by the Forest Service, may be issued by the Secretary of the Interior only with the consent of, and subject to such terms and conditions as may be prescribed by, the head of that Department to insure adequate utilization of the lands for the purpose for which they were withdrawn or acquired.

§ 3201.1–4 Federal Power Commission.

Leases for lands to which section 24 of the Federal Power Act, as amended (16 U.S.C. 818), is applicable, may be issued by the Secretary of the Interior only with the consent of, and subject to, such terms and conditions as the Federal Power Commission may prescribe to insure adequate utilization of such lands for power and related purposes.

§ 3201.1–5 Patented lands.

(a) Geothermal resources in lands which have passed from Federal ownership subject to a reservation to the United States of geothermal resources therein may be leased under the regulations in this group subject to the provisions in this part and to such terms and conditions as may be prescribed by the authorized officer to insure adequate protection of the patented lands and any improvements thereon.

(b) Geothermal resources in lands the surface of which has passed from Federal ownership but in which the minerals have been reserved to the United States shall not be developed or produced except under terms and conditions prescribed by the Secretary and pursuant to any agreements made therefor while the question of the title to such resources is being resolved pursuant to the provisions of section 21(b) of the Act.

§ 3201.1–6 Excepted areas.

Leases shall not be issued for lands which are: (a) Administered under the National Park System; (b) within a national recreation area; (c) in a fish hatchery administered by the Secretary, wildlife refuge, wildlife range, game range, wildlife management area, or waterfowl production area, or for lands acquired or reserved for the protection and conservation of fish and wildlife which are designated as rare and endangered species by the Secretary; or under active consideration for inclusion in categories (a), (b), or (c) as evidenced by the filing of an application for a withdrawal or a proposed withdrawal; or (d) tribally or individually owned Indian trust or restricted lands, within or without the boundaries of Indian reservations.

§ 3201.2 Acreage limitations.

(a) *Maximum holdings.* No citizen, association, corporation, or governmental unit shall take, hold, own, or control at one time, whether acquired directly from the Secretary or otherwise, any direct or indirect interest in Federal geothermal leases in any one State exceeding 20,480 acres, including leases acquired under the provisions of section 4 (a)–(f) of the Act. Nor may any citizen, association, or corporation be permitted to convert mineral leases, permits, applications therefor, or mining claims, pursuant to the provisions of section 4 (a)–(f) of the Act into geothermal leases for more than 10,240 acres.

(b) *Computation.* In computing acreage holdings or control, the accountable acreage of a party owning an undivided interest in a lease shall be that party's proportionate part of the total lease acreage. Likewise, the accountable acreage of a party owning an interest in a corporation or association shall be his proportionate part of the corporation's or association's accountable acreage except that no person shall be charged with his pro rata share of any acreage holdings of any association or corporation unless he is the beneficial owner of more than 10 per centum of the stock or other instruments of ownership or control of that association or corporation. Parties owning a royalty or other interest determined by or payable out of a percentage of production from a lease will be charged with a similar percentage of the total lease acreage.

(1) An association shall not be deemed to exist between the parties to a contract for development of leased lands, whether or not coupled with an interest in the lease, nor between co-lessees, but each party to any such contract or each co-lessee will be charged with his proportionate interest in the lease.

(2) Lessees holding acreage in common shall be considered a single entity and cannot hold acreage in excess of the maximum specified in the law for any one lessee.

(c) *Excepted acreage.* Leases committed to any unit or cooperative plan approved or prescribed by the Secretary of the Interior shall not be included in computing accountable acreage. Leases subject to an operating, drilling or development contract approved by the Secretary pursuant to section 18 of the Act, other than communization or drilling agreements, shall be excepted in determining the accountable acreage of the lessees or operators.

(d) *Excess acreage.* (1) Where, as the result of the termination or contraction of a unit or cooperative plan, or the elimination of a lease from operating, drilling, or development plan, a party holds or controls excess accountable acreage, such party shall have 90 days from such termination or contraction or elimination in which to reduce his holdings to the prescribed limitation.

(2) If any person holding or controlling leases or interests in leases is found to hold accountable acreage in violation of the provisions of this section and of the Act, the last lease or leases or interest or interests acquired by him which created the excess acreage holdings shall be canceled or forfeited in their entirety, even though only part of the acreage in the lease or interest constitutes excess holdings, unless it can be shown to the satisfaction of the Director that the holding or control of the excess acreage is not the result of negligence or willful intent in which event the lease or leases shall be canceled only to the extent of the excess acreage.

(3) Any person holding or controlling leases or interests in leases below the acreage limitation provided in this section, shall be subject to these rules:

(i) If he files an application which causes him to exceed the acreage limitation, that application will be rejected. (ii) If he files a group of applications at the same time, any one of which causes him to exceed the acreage limitation, the entire group of applications will be rejected.

(4) If any person holding or controlling leases or interests in leases below the acreage limitation provided in this section, acquires a lease or leases, or an interest or interests therein, which cause him to exceed the acreage limitation, his most recently filed application for lease or applications for leases then containing acreage in excess of the limitation provided in this section will be rejected in its or their entirety. For the purpose of this subparagraph, time of filing shall be determined by the date of filing marked on the application, or, if the same date is marked on two or more applications, by the serial number of the applications.

(e) *Showing required.* No lease will be issued and no transfer or operating agreement will be approved until it has been shown that the applicant, operator, or transferee is entitled to hold the acreage or obtain the operating rights. At any time upon request by the authorized officer, the record title holder of any lease or a lease operator or a lease applicant may be required to file in the proper BLM office a statement, showing as of a specified date the serial number and the date of each lease of which he is the record holder, or under which he holds operating rights, and each application for lease held or filed by him in the particular State setting forth the acreage covered thereby, and the nature, extent and acreage interest, including royalty interests held by him in any geothermal lease of which the reporting party is not the lessee of record, whether by corporate stock ownership, interest in unincorporated associations and partnerships, or in any other manner.

§ 3201.3 Leases within unit areas.

Before issuance of a geothermal lease for lands within an approved unit agreement, the lease applicant or successful bidder will be required to file evidence that he has entered into an agreement with the unit operator for the development and operation of the lands in a lease if issued to him under and pursuant to the terms and provisions of the approved unit agreement, or a statement giving satisfactory reasons for the failure to enter into such agreement. If such

statement is acceptable, he will be permitted to operate independently but will be required to perform his operations in a manner which the Supervisor deems to be consistent with the unit operations.

Subpart 3202—Qualifications of Lessees

§ 3202.1 Who may hold leases.

Leases may be issued only to: (a) Citizens of the United States who have reached the age of majority; (b) associations of such citizens; (c) corporations organized under the laws of the United States, any state or the District of Columbia; or (d) governmental units, including, without limitation, municipalities. The term "association" includes a partnership.

§ 3202.2 Statements required to be submitted.

§ 3202.2–1 General.

(a) Each applicant for a lease is required to submit with his application a statement that his interests, direct and indirect, in Federal geothermal leases do not exceed the acreage limitations prescribed in § 3201.2, together with a statement of his citizenship.

(b) If the applicant is an association or corporation the application must be accompanied by: (1) A statement showing that it is authorized to hold geothermal leases; (2) a statement that the officer executing the application is authorized to act on behalf of the association or corporation; (3) a statement setting forth the State in which it was incorporated or formed and the names and addresses of all members or stockholders holding more than 10 percent of the association or corporation; and (4) a statement from each person owning or controlling more than 10 percent of the association or corporation setting forth his citizenship and his holdings.

(c) If the applicant is a municipality, or governmental unit, the application must be accompanied by: (1) A statement showing that it is authorized to hold geothermal leases; (2) a statement that the officer executing the application is authorized to act on behalf of the municipality or governmental unit, and (3) a copy of its governing body's resolution authorizing such action.

§ 3202.2–2 Guardian or trustee.

(a) *Guardian.* If the application is made by a guardian, he must submit: (1) A certified copy of the court order authorizing him to act as guardian and, in behalf of his ward, to enter into contractual agreements and to fulfill all obligations arising under the lease; and (2) statements as to the citizenship and holdings under the Act of himself and of each person under his guardianship for whom the application is made.

(b) *Trustee.* If the application is made by a trustee, he must submit a copy of the instrument establishing the trust or a certified copy of the court order authorizing him to act as trustee, in behalf of the beneficiary, as to all obligations arising under the lease; and statements as to the citizenship and holdings under the Act of himself and of each beneficiary.

§ 3202.2–3 Attorney-in-fact.

If an application is filed by an attorney-in-fact, it must be accompanied by a statement as to his authority to act.

§ 3202.2–4 Statements previously filed.

Where the statements required by § 3202.2 have been previously filed a reference by serial number to the record in which they have been filed, together with a statement as to any amendments will be accepted.

§ 3202.2–5 Showing as to sole party in interest.

Each application must indicate whether the applicant is the sole party in interest. Where the applicant is not the sole party in interest, separate statements must be signed by each of the parties and by the applicant setting forth the nature of the agreement between them. All interested parties must furnish evidence of their qualifications to hold such lease interest. These separate statements must be filed in the proper BLM office with the application, except as provided in § 3211.2 of this chapter.

§ 3202.2–6 Heirs and devisees (estates).

If an applicant or a successful bidder dies before the lease is issued, the lease will be issued to the executor or administrator of the estate if probate of the estate has not been completed, and if probate has been completed, or is not required, to the heirs or devisees, provided there is filed in all cases an application to lease in compliance with the requirements of this section which will be effective as of the effective date of the original application filed by the deceased. If there are any minor heirs or devisees, the application can only be made by their legal guardian or trustee in his name. Each such application must be accompanied by the following information:

(a) Where probate of the estate has not been completed:

(1) Evidence that the person who as executor or administrator submits the application, and bond form if a bond is required, has authority to act in that capacity and to sign the application and bond forms.

(2) A statement over the signature of each heir or devisee or, if the heir or devisee is a minor, over the signature of his legal guardian or trustee, concerning citizenship and holdings.

(3) Evidence that the heirs or devisees are the heirs or devisees of the deceased applicant or successful bidder and are the only heirs or devisees of the deceased.

(b) Where the executor or administrator has been discharged or no probate proceedings are required:

(1) A certified copy of the will or decree of distribution, if any, and if not, a statement signed by the heirs that they are the only heirs of the applicant or successful bidder and the provisions of the law of the deceased's last domicile showing that no probate is required.

(2) A statement over the signature of each of the heirs or devisees with reference to holdings and citizenship. If the heir or devisee is a minor, the statement must be over the signature of the guardian or trustee.

§ 3202.2–7 Fractional present interests.

(a) An application for a fractional present interest noncompetitive lease must be executed on a form approved by the Director and it must be accompanied by a statement showing the extent of the applicant's ownership of the operating rights to the fractional geothermal resources interest not owned by the United States in each tract covered by the application to lease. Ordinarily, the issuance of a lease to one who, upon such issuance, would own less than 50 percent of the operating rights in any such tract, will not be regarded as in the public interest, and an application leading to such results will be rejected.

(b) Geothermal resources in lands which have passed from Federal ownership but which lands have been purchased by the Federal Government with a fractional interest in the geothermal resources shall not be developed or produced, except under prescribed terms and conditions and pursuant to any agreement made between the parties of interest prior to the resolution of the question of ownership of the geothermal resources.

Subpart 3203—Leasing Terms

§ 3203.1 Primary and additional term.

§ 3203.1–1 Dating of leases.

All geothermal leases will be dated as of the first day of the month following the date on which the leases are signed on behalf of the lessor except that, where prior written request has been made, a lease may be dated as of the first day of the month within which it is so signed. A renewal lease will be dated from the termination of the original lease.

§ 3203.1–2 Primary term.

All leases shall be for a primary term of 10 years.

§ 3203.1–3 Additional term.

(a) If geothermal steam is produced or utilized in commercial quantities within the primary term of a lease, that lease shall continue for so long thereafter as geothermal steam is produced or utilized in commercial quantities, but the lease shall in no event continue for more than 40 years after the end of the primary term except that the lessee shall have a preferential right to a renewal of his lease for a second 40-year term upon such terms and conditions as the authorized officer deems appropriate, if at the end of the first 40-year term the lands are not needed for another purpose and geothermal steam is produced or utilized in commercial quantities. Production or utilization of geothermal steam in commercial quantites shall be deemed to include the completion of one or more wells producing or capable of

producing geothermal steam in commercial quantities and a bona fide sale of such geothermal steam for delivery to or utilization by a facility or facilities not yet installed but scheduled for installation not later than 15 years from the date of commencement of the primary term of the lease.

§ 3203.1–4 Extensions.

(a) A lease which has been extended by reason of production, or on which geothermal steam has been produced, and which has been determined by the Secretary to be incapable of further commercial production and utilization of geothermal steam may be further extended so long as one or more valuable byproducts are produced in commercial quantities but for not more than 5 years.

(b) Where the lessee commenced actual drilling operations prior to the end of the primary term and those operations are being diligently prosecuted at that time, a lease shall be extended for a period of five years and so long thereafter as geothermal steam is produced or utilized in commercial quantities (but for not more than 35 years).

(c) A lease committed to a cooperative plan, communitization agreement or a unit plan under or for which actual drilling operations were commenced prior to the end of the primary term of the lease, shall, if such operations are being diligently prosecuted at that time be extended for a period of five years and so long thereafter as geothermal steam is produced or utilized in commercial quantities (but for not more than thirty five years).

(d) Any lease on which there has been a suspension of operations or production, or both, under 30 CFR 270.17 shall continue in effect for the life of the suspension and, at the end of the suspension, shall be extended for a period equal to that portion of the primary term during which the suspension was in effect.

(e) If, at the end of 40 years after the conclusion of the primary term, steam is being produced or utilized in commercial quantities and the lands are not needed for other purposes, the lessee shall have a preferential right to a renewal of the lease for a second 40-year term on such terms and conditions as the Secretary deems appropriate.

§ 3203.1–5 Segregation of leases on commitment to, or contraction of, cooperative or unit plan or cummunitization or drilling agreement.

(a) Any lease committed to any cooperative plan, communitization agreement, drilling agreement, or unit plan, which covers lands within and lands outside the area covered by the plan or agreement, shall be segregated, as of the effective date of that plan or agreement, into separate leases, one covering the lands committed to that plan or agreement and the other as to the lands not so committed. The segregated lease covering the portion of the lands not subject to that plan or agreement shall not be entitled to an extension by reason of the segregation, but the term of the lease of such segregated lands shall be as provided in the original lease.

(b) When only part of the land subject to a lease included in a cooperative plan, a communitization agreement, a drilling agreement, or a unit plan is excluded from that plan or agreement because of the contraction of the area subject to that plan or agreement, the part of the lease which is excluded and the part which remains subject to the plan or agreement shall be segregated into separate leases. The term of the segregated lease composed of the excluded land shall not be extended because of production in commercial quantities or the existence of a producible well on the segregated lease remaining subject to the cooperative or unit plan or the communitization or drilling agreement or because actual drilling operations were at the time of contraction being conducted on that other lease, but the term of the lease composed of the excluded land shall be as provided in the original lease.

(c) Where all the land subject to a lease included in a cooperative plan, a communitization agreement, a drilling agreement, or a unit plan is excluded from that plan or agreement because of the contraction of the area subject to that plan or agreement, the term of the lease shall not be extended because of production in commercial quantities or the existence of a producible well on the lands remaining subject to the cooperative or unit plan or the communitization or drilling agreement or because actual drilling operations were being conducted on the other lands, but the term of the lease shall be as provided in the original lease.

(d) Contraction of a unit or cooperative plan or a communitization or drilling agreement causing all or part of the land in the lease to be excluded from such plan or agreement shall not serve to extend the term of such lease excluded by reason of the contraction where the 10-year primary term has already expired.

§ 3203.1–6 Conversion to mineral leases or mining claims.

(a) If the byproducts capable of being produced in commercial quantities are leasable under the Mineral Leasing Act of February 25, 1920 as amended and supplemented (30 U.S.C. sections 181–287), or under the Mineral Leasing Act for Acquired Lands (30 U.S.C. sections 351–359), and the leasehold is primarily valuable for the production thereof, the lessee shall be entitled to convert his geothermal lease to a mineral lease under and subject to all the terms and conditions of the appropriate act, provided the lands and its resources are available for this purpose, upon application at any time before expiration of the lease extension by reason of byproduct production.

(b) The lessee shall be entitled to locate under the mining laws all minerals which are not leasable and which would constitute a byproduct if commercial production or utilization of geothermal steam continued. The lessee, to acquire the rights herein granted him, shall complete the location of mining claims within 90 days after the termination of the geothermal lease, provided the lands and its resources are available for location.

(c) Any lease converted under paragraphs (a) or (b) of this section affecting lands withdrawn or acquired in aid of a function of a Federal department or agency, including the Department of the Interior, shall be subject to such additional terms and conditions as may be prescribed by that department or agency with respect to the additional operations or effects resulting from such conversion upon the utilization of the lands for the purpose for which they are administered.

§ 3203.2 Lease acreage limitation.

(a) A geothermal lease may not embrace more than 2,560 acres in a reasonably compact area, except where a departure is occasioned by an irregular subdivision or subdivisions, entirely within an area of six miles square or within an area not exceeding six surveyed or protracted sections in length or width measured in cardinal directions. Where a departure is occasioned by an irregular subdivision, the leased acreage may exceed 2,560 acres by an amount which is smaller than the amount by which the area would be less than 2,560 acres if the irregular subdivision were excluded. No lease will be issued for less than 640 acres, except at the discretion of the Secretary, or where a departure is occasioned by an irregular subdivision, or as provided for in Subpart 3230 of this chapter. In event of a departure, the leased acreage may be less than 640 acres by amount which is smaller than the amount by which the area would be more than 640 acres if the irregular subdivision were added.

(b) The authorized officer may add isolated tracts in nearby sections, notwithstanding the 640-acre minimum, where it is determined that such addition is necessary for the proper management of the resource, provided the additional lands will not cause the lessee to exceed the maximum acreage limitation as provided in § 3201.2(a) of this chapter. However, prior to the issuance of such a lease based on the application as amended by the authorized officer, the applicant will be given the option to refuse such a lease. Failure of the applicant to execute and return the lease within 30 days after receipt thereof will constitute a withdrawal of his application, as amended, without further notice.

§ 3203.3 Consolidation of leases.

Two or more contiguous leases issued to the same lessee may be consolidated if the total combined acreage does not exceed 2,560 acres. Except where a deacreage is caused by an irregular subdivision or subdivisions as stated in § 3203.2.

§ 3203.4 Description of lands.

Applications and nominations shall include a description of the lands sought to be included in a geothermal lease.

(a) *Surveyed lands.* If the lands have been surveyed under the public land rectangular system, each application or nomination shall describe the lands by legal subdivision, section, township, and range.

(b) *Unsurveyed lands.* If the lands have not been so surveyed, each application shall describe the lands by metes and bounds, giving courses and distances between the successive angle points on the boundary of the tract, in cardinal directions except where the boundaries of the lands are in irregular form, and connected by courses and distances to an official corner of the public land surveys or to a prominent topographic feature. In Alaska the description of unsurveyed lands must be connected by courses and distances to either an official corner of the public land surveys or to a triangulation station established by any agency of the United States (such as the U.S. Geological Survey, the Coast and Geodetic Survey, or the International Boundary Commission), if the record position thereof is available to the general public.

(c) When protracted surveys have been approved and the effective date thereof published in the FEDERAL REGISTER, each application or nomination for lands shown on such protracted surveys, filed on or after such effective date, shall describe the lands according to the legal subdivision, section, township, and range shown on the approved protracted surveys.

(d) *Unsurveyed public lands adjacent to tidal waters in southern Louisiana and in Alaska.* In lease applications embracing unsurveyed public lands adjacent to tidal waters in southern Louisiana and in Alaska, if the applicant finds it impracticable to furnish a metes and bounds description, as required in paragraph (b) of this section with respect to the water boundary, he may, at his option, extend the boundary of his application into the water a distance sufficient to permit complete enclosure of the water boundary of his application by a series of courses and distances in cardinal directions (the object being to eliminate the necessity of describing the meanders of the water boundary of the public lands included in the application). The description in the lease application shall in all other respects conform to the requirements of paragraph (b) of this section. Such description would not be deemed for any purpose to describe the true water boundaries of the lease, such boundaries in all cases being the ordinary high water mark of the navigable waters. The land boundaries of such overall area shall include only the public lands embraced in the application. The applicant shall agree to pay rental on the full acreage included within the description with the understanding that rights under any lease to be issued on that application will apply only to the areas within that description properly subject to lease under the act, but that the total area described will be considered as the lease acreage for purposes of rental payments, acreage limitations under § 3201.2 of this chapter and the maximum or minimum area to be included in a lease pursuant to § 3203.2. The tract should be shown in outline on a current quadrangle sheet published by the U.S. Geological Survey or such other map as will adequately identify the lands described.

§ 3203.5 Diligent exploration.

Each geothermal lease will include provisions for the diligent exploration of the leased resources until there is production in commercial quantities applicable to the lands subject to the lease, and failure to perform such exploration may subject the lease to termination. Diligent exploration means exploration operations (subsequent to the issuance of the lease) on, or related to the leased lands, including, but not limited to, operations such as geochemical surveys, heat flow measurements, core drilling, or drilling of a test well. Exploration operations, in order to qualify as diligent exploration, must be approved by the Supervisor, and evidence of all expenditures therefor and the results thereof must be submitted annually to the Supervisor in compliance with applicable regulations and Geothermal Resources Operational (GRO) Orders or upon his request. Moreover, after the fifth year of the primary lease term, exploration operations, to qualify as diligent exploration for a year, must entail expenditures during that year equal to at least two times the sum of (a) the minimum annual rental required by statute, and (b) the amount of rental for that year in excess of the fifth year's rental, but in no event shall the required expenditures exceed twice the rental for the 10th year. However, any expenditures for diligent operations during the first 5 years of the lease and any expenditures for diligent operations during any subsequent year in excess of the minimum required expenditures for that year may be credited, in such proportions as the lessee may designate, against (1) expenditures needed to qualify exploration operations as diligent operations for future years, or (2) any rental requirement for that or any future years in excess of the fifth year's rental pursuant to § 3205.3–3 of this chapter. In all cases, the lessee must pay the basic annual rental specified in the lease for the initial five years of the primary term until there is production of geothermal steam in commercial quantities on the leased lands.

§ 3203.6 Plan of operation.

A lessee will be required to submit a plan of operation pursuant to 30 CFR 270.34, prior to entry upon the leased lands for any purpose other than casual use as that term is defined in § 3209.0–5 (d) of this chapter. Operations will not be permitted on the lands until the plan of operation has been approved.

Subpart 3204—Surface Management Requirements, Special Requirements

§ 3204.1 General.

A lessee shall comply with and be bound by the following general terms and conditions, the specific requirements contained in the lease stipulations and any GRO orders that may be issued pursuant to 30 CFR 270.11. Assuring compliance with the requirements of this section is the responsibility of the Supervisor as to the lands within the area of operations and is the responsibility of the appropriate land management agency as to the remaining lands in the lease.

(a) *Equal employment opportunity.* The lessee shall comply with Executive Order 11246, as amended, 30 F.R. 12319 (1965), and regulations issued pursuant thereto, 41 CFR Chapter 60 and 43 CFR Part 17.

(b) *Public access.* (1) The lessee shall permit free and unrestricted public access to and upon the leased lands for all lawful and proper purposes except in areas where such access would unduly interfere with operations under the lease or would constitute a hazard to health and safety. Restrictions on access will not be allowed without prior approval.

(2) During construction, the lessee shall regulate public access and vehicular traffic to protect the public, wildlife, and livestock from hazards associated with the project. For this purpose, the lessee shall provide warnings, fencing, flag men, barricades, and other safety measures as appropriate.

(c) *Pollution abatement.* The lessee shall comply with all Federal and State standards and all applicable local standards with respect to the control of all forms of air, land, water, and noise pollution, including, but not limited to, the control of erosion and the disposal of liquid, solid, and gaseous wastes. The Supervisor may, in his discretion, establish additional and more stringent standards, and, if he does so, the lessee shall comply with those standards. The lessee, in addition to any other action required by those standards, shall take the following specific actions:

(1) *Pesticides and herbicides.* The lessee shall comply with all rules issued by the Department of the Interior and the Environmental Protection Agency pertaining to the use of poisonous substances on public lands.

(2) *Water pollution.* The lessee shall conduct lease operations and maintenance in accordance with Federal and State water quality standards and public health and safety standards, and applicable local water quality standards and public health and safety standards. Toxic materials shall not be released into any surface waters or underground waters. Reinjection of waste geothermal fluids into geothermal or other suitable aquifers will be permitted upon approval of the lessee's plan of operation submitted pursuant to 30 CFR 270.34.

(3) *Air pollution.* The lessee shall control emissions from operations in accordance with Federal and State air quality standards, and applicable local air quality standards.

(4) *Erosion control.* The lessee shall minimize disturbance to vegetation, drainage channels, and streambanks. The lessee shall employ such soil and resource conservation and protection measures on the leased lands as the Supervisor deems necessary.

(5) *Noise control.* The lessee shall control noise emissions from operations, in accordance with Federal and State noise emission standards, and applicable local noise emission standards.

(d) *Sanitation and waste disposal.* The lessee shall remove or dispose of all waste material generated in connection with the exploration, development, production and transportation operations in a manner set forth in the approved plan of operation submitted pursuant to 30 CFR 270.34.

(e) *Land subsidence, seismic activity.* The lessee shall take precautions necessary to minimize land subsidence or seismic activity which could result from production of geothermal resources and the disposal of waste fluid where such activity could damage or curtail the use of the geothermal resources or other resources, or other uses of the land and take such measures as stipulated to: (1) monitor operations for land subsidence and for seismic activity; and (2) maintain, and when requested, make available to the lessor, records of all monitoring activities.

(f) *Aesthetics.* The lessee shall take aesthetics into account in the planning, design, and construction of facilities on the leased premises.

(g) *Fish and wildlife.* The lessee shall employ such measures as are deemed necessary to protect fish and wildlife and their habitat.

(h) *Antiquities and historical sites.* The lessee shall conduct activities on discovered, known or suspected archeological, paleontological, or historical sites in accordance with lease terms or specific instructions.

(i) *Restoration.* The lessee shall provide for the restoration of all disturbed lands in an approved manner.

(j) The lessee shall submit annual reports to the authorized officer on compliance with the requirements of paragraphs (b)–(i) of this section and report within 24 hours, and if the report is oral, shall confirm the report in writing within 30 days, any significant environmental damage suffered by the lands subject to his lease. However, if, after drilling operations have begun, the lessee is required to submit a similar report under 30 CFR 270.30 and 270.76, he may fulfill the requirement of this subsection by submitting to the authorized officer a copy of that report.

§ 3204.2 Waste prevention.

All leases shall be subject to the condition that the lessee will, in conducting his exploration, development, and producing operations, use all reasonable precautions to prevent waste of geothermal resources and other natural resources found or developed in the leased lands.

§ 3204.3 Readjustment of terms and conditions.

(a) (1) Except as otherwise provided by law, the terms and conditions of any geothermal lease may be readjusted as determined by the authorized officer at not less than 10-year intervals beginning 10 years after the date geothermal steam is produced. Each lease shall provide for such readjustments.

(2) The authorized officer shall give notice to the lessee of any proposed readjustment of the terms and conditions of the lease and the nature thereof, and unless the lessee files with the authorized officer an objection to the proposed terms and conditions or relinquishes the lease within 30 days after receipt of such notice, the lessee shall be deemed conclusively to have agreed to such terms and conditions. If the lessee files objections, and agreement cannot be reached between the authorized officer and the lessee within a period of 60 days, the lease may be terminated by either party, subject to the provisions of § 3000.4 of this chapter. If the lessee files objections to the proposed readjusted terms and conditions, the existing terms and conditions, except for those concerning rental and royalty rates, will remain in effect until there has been an agreement between the authorized officer and the lessee on the new terms and conditions to be applied to the lease or until the lease is terminated. The readjustment of any terms concerning rental and royalty rates will be subject to § 3205.3 of this chapter.

(b) Any readjustment of the terms and conditions of any lease of lands withdrawn or acquired in aid of a function of a Federal department or agency may be made only with the approval of that other agency.

§ 3204.4 Reservation to the United States of oil, hydrocarbon gas, and helium.

The United States reserves the ownership of and the right to extract oil, hydrocarbon gas, and helium from all geothermal steam and associated geothermal resources produced from lands leased under the Act. Whenever the right to extract oil, hydrocarbon gas, and helium, from geothermal steam and associated geothermal resources produced from such lands is exercised, it shall be exercised so as to cause no substantial interference with the production of geothermal resources from such lands.

§ 3204.5 Compensation for drainage; compensatory royalty.

(a) Upon a determination by the Supervisor that lands owned by the United States are being drained of geothermal resources by wells drilled on adjacent or cornering lands, the authorized officer may execute agreements with the owners of adjacent or cornering lands whereby the United States, or the United States and its lessees, shall be compensated for such drainage, such agreements to be made with the consent of any lessee affected thereby. The precise nature of any agreement will depend on the conditions and circumstances involved in the particular case.

(b) Where land in any lease is being drained of its geothermal resources by a well either on a Federal lease issued at a lower rate of royalty or on land not the property of the United States, the lessee must drill and produce all wells necessary to protect the leased lands from drainage. In lieu of drilling such wells, the lessee may, with the consent of the Supervisor, pay compensatory royalty in the amount determined in accordance with 30 CFR Part 270.

§ 3204.6 Patented lands.

The terms and conditions of any geothermal resource lease for lands conveyed by the United States subject to a reservation to the United States of geothermal resources may be readjusted upon notification to the surface owner.

Subpart 3205—Service Charges, Rentals and Royalties

§ 3205.1 Payments.

§ 3205.1–1 Form of remittance.

Remittances required under these regulations may be made by cash payment, check certified check, bank draft, bank cashier's check, or money order. All remittances will be deposited as received.

§ 3205.1–2 Where submitted.

(a) *Rentals on nonproducing leases.* Rentals under all nonproducing leases issued shall be paid at the proper BLM office. All remittances to the Bureau of Land Management shall be made payable to the Bureau of Land Management.

(b) *Other payments.* All royalties on producing leases, communitized leases in producing well units, unitized leases in producing unit areas, leases on which compensatory royalty is payable and all royalty payments under easements for directional drilling are to be paid to the Supervisor. All remittances to the Supervisor shall be made payable to the U.S. Geological Survey.

§ 3205.2 Service charges.

(a) *Competitive lease applications.* No service charge is required.

(b) *Noncompetitive lease applications.* Applications for noncompetitive leases must be accompanied by a nonrefundable service charge of $50 for each application.

(c) *Assignments.* Applications for approval of an assignment of a lease or interest therein must be accompanied by a nonrefundable service charge of $50 for each application.

(d) *Nominations.* No service charge is required.

§ 3205.3 Rentals and royalties.

§ 3205.3–1 Payment with application.

Each application, except an application filed pursuant to Subpart 3211 of

this chapter, of this part, must be accompanied by payment of the first year's rental of $1 per acre or fraction thereof based on the total acreage included in the application. An application accompanied by a payment of the first year's rental which is deficient by not more than 10 percent will be approved by the authorized officer provided all other requirements are met, but, if the additional rental is not paid within 30 days from notice, the application or the lease, if issued, will be canceled. If the annual rental rate established for the lease to be issued is more than $1 per acre or fraction thereof, the applicant will be required to submit the additional rental prior to issuance of the lease upon notice from the authorized officer.

§ 3205.3–2 Payment of annual rental.

(a) Annual rental in the amount specified in the lease which shall be not less than $1 per acre or fraction thereof must be paid in advance and must be received by the proper BLM office on or before the anniversary date of the lease. If there is no well on the leased lands capable of producing geothermal resources in commercial quantities, the failure to pay rental on or before the anniversary date shall terminate the lease by operation of law, except as provided by § 3244.2 of this chapter.

(b) If, on the anniversary date of the lease, less than a full year remains in the lease term, the rentals shall be payable in the same proportion as the period remaining in the lease term is to a full year. The rentals shall be prorated on a monthly basis for the full months, and on a daily basis for the fractional month remaining in the lease term. For the purpose of prorating rentals for a fractional month, each month will be deemed to consist of 30 days.

(c) If the term of a lease for which prorated rentals have been paid is further extended to or beyond the next anniversary date of the lease, rentals for the balance of the lease year shall be due and payable on the 1st day of the first month following the date through which the prorated rentals were paid. If the rentals are not paid for the balance of the lease year, the lease will be subject to cancellation. However, if the anniversary date occurs before the end of the notice period, the rental for the following lease year shall nevertheless be due on the anniversary date and failure to pay the full rental for that year on or before that date shall cause the lease to terminate automatically by operation of law except as provided by § 3244.2 of this chapter. The lessee shall not be relieved of liability for rental due for the balance of the previous lease year.

(d) If the payment is due on a day in which the proper BLM office to receive payment is not open, payment received on the next official working day will be deemed to be timely.

§ 3205.3–3 Escalating rental rates.

To encourage the orderly and timely development of geothermal leases, all leases issued pursuant to the regulations in this Group will provide that, beginning with the sixth year and for each year thereafter until the lease year beginning on or after the commencement of production of geothermal resources in commercial quantities, the rental will be set by the authorized officer as the amount of rental for the preceding year plus an additional rental of $1 per acre, or fraction thereof, but the authorized officer may, upon a showing of sufficient justification by the lessee, waive the payment of all or any portion of the additional rental

§ 3205.3–4 Fractional interests.

Rentals, minimum royalties, and royalties payable for lands in which the United States owns an undivided fractional interest shall be in the same proportion to the rentals, minimum royalties, and royalties provided for in § 3205.3, as the undivided fractional interest of the United States in the geothermal resources is to the full geothermal resources interest.

§ 3205.3–5 Royalty on production.

Royalty shall be paid at the following rates on geothermal resources:

(a) A rate, as set forth in the lease, of not less than 10 per centum and not more than 15 per centum of the amount or value of steam, or any other form of heat or energy derived from production under the lease and sold or utilized by the lessee or reasonably susceptible to sale or utilization by the lessee; (b) a rate as set forth in the lease, of not more than 5 per centum of any byproduct derived from production under the lease and sold or utilized or reasonably susceptible of sale or utilization by the lessee, except that as to any byproduct which is a mineral named in section 1 of the Mineral Leasing Act of February 25, 1920, as amended (30 U.S.C. 181), the rate of royalty for such mineral shall be the same as that provided in that Act and the maximum rate of royalty for such mineral shall not exceed the maximum royalty applicable under that Act; (c) in no event shall the royalty on any producing lease for any lease year, commencing with the lease year beginning on or after the commencement of production in commercial quantities, be less than $2 per acre or fraction thereof, and this minimum royalty, in lieu of rental, shall be payable at the expiration of each lease year.

§ 3205.3–6 Royalty on commercially demineralized water.

All geothermal leases issued pursuant to the provisions of this group shall provide for the payment to the lessor of a royalty on commercially demineralized water at a rate to be specified in the lease of not more than 5 per centum of the value of such commercially demineralized water that has been sold or utilized by the lessee or is reasonably susceptible of sale or utilization by the lessee, except that no payment of a royalty will be required on such water if it is used in plant operation for cooling or in the generation of electric energy or otherwise.

§ 3205.3–7 Waiver, suspension or reduction of rental or royalty.

(a) The authorized officer may waive, suspend, or reduce the rental or royalty for any lease or portion thereof in the interests of conservation and to encourage the greatest ultimate recovery of geothermal resources if he determines that this is necessary to promote development or that the lease cannot be successfully operated under the lease terms. No waiver, suspension or reduction of rental or royalty will be granted where the only reason for the request for such relief is the unavailability of power generating facilities to utilize the geothermal steam.

(b) An application hereunder shall be filed in triplicate with the Supervisor, and must: (1) Contain the serial number of the leases and the names of the lessee and operator; (2) show the number, location, and status of each well that has been drilled, a tabulated statement for each month covering a period of not less than 6 months prior to the date of filing the application of the aggregate amount of production subject to royalty computed in accordance with the operating regulations, the number of wells counted as producing each month, and the average production per well per day; (3) contain a detailed statement of expenses and costs of operating the lease, the income from the sale of any leased products and all facts tending to show whether the wells can be successfully operated using the royalty or rental fixed in the lease; and (4) where the application is for a reduction in royalty, furnish full information as to whether royalties or payments out of production are paid to others than to the United States, the amounts so paid, and the efforts made to reduce them. The applicant must also file agreements of the holders to a comparable reduction of all other royalties from the leasehold to an aggregate not in excess of one-half the Government royalties.

§ 3205.3–8 Application for and effect of suspension of operations and production.

(a) Applications by lessees for suspensions of operations or production, or both, under a producing geothermal lease (or for relief from any drilling or producing requirements of such a lease) shall be filed in triplicate with the Supervisor, who is authorized to act on applications filed pursuant to this section and to terminate suspensions which have been or may be granted. Complete information must be furnished showing the necessity of the relief sought.

(b) A suspension shall take effect as of the time specified in the order of the Supervisor. Rental or minimum royalty payments will be suspended during any period of suspension of all operations and production directed, or assented to, by the Supervisor, beginning with the first day of the lease month in which the

suspension of operations and production becomes effective or, if the suspension of operations and production becomes effective on any date other than the first day of a lease month, beginning with the first day of the lease month following such effective date. The suspension of rental or minimum royalty payments shall end on the first day of the lease month in which operations or production is resumed. Where rentals are creditable against royalties and have been paid in advance, proper credit will be allowed on the next rental or royalty due under the lease.

(c) No lease shall be deemed to expire by reason of a suspension of either operations or production, pursuant to any order or assent of the Supervisor.

(d) If there is a well on the leased premises capable of producing geothermal resources and all operations and production are suspended pursuant to any order of the Supervisor, approval of recommencement of drilling operations will terminate the suspension as to operations but not as to production, and will terminate both the period of suspension of rental and minimum royalty payments provided in paragraph (b) of this section and the period of suspension for which an equivalent extension will be granted. However, as provided in paragraph (c) of this section, the lease will not be deemed to expire so long as the suspension of operations or production remains in effect.

(e) The relief authorized under this section may also be obtained for any leases included within an approved unit or cooperative plan of development and operation.

(f) See 30 CFR 270.17 for regulations concerning action of the Supervisor on applications filed pursuant to this section.

§ 3205.3–9 Readjustments.

The rentals and royalties of any geothermal lease may be readjusted at not less than 20-year intervals beginning 35 years after the date geothermal steam is produced as determined by the Supervisor. In the event of any such readjustment neither the rental nor royalty paid during the preceding period shall be increased by more than 50 per centum, and in no event shall the royalty payable exceed 22½ per centum. Each geothermal lease shall provide for such readjustment. The Supervisor will give notice of any proposed readjustment of rental or royalties. Unless the lessee relinquishes the lease within 30 days after receipt of such notice, he shall conclusively be deemed to have agreed to such terms and conditions. If the lessee files a protest, and no agreement can be reached between the authorized officer and the lessee within a period of 60 days, the lease may be terminated by either party, subject to the provisions of § 3000.4 of this chapter. If the lessee files a protest to the proposed readjusted terms and conditions, the existing terms and conditions will remain in effect until there has been an agreement between the authorized officer and the lessee on the new terms and conditions to be applied to the lease or until the lease is terminated, except payments of any proposed readjusted rentals and royalties must be paid in the timely manner prescribed in these regulations and may be paid under protest. The readjusted terms and conditions will be effective as of the end of the term being adjusted.

§ 3205.4 Rental and minimum royalty liability of lands committed to cooperative or unit plans.

§ 3205.4–1 Prior to production.

All lands within any lease committed to an approved cooperative or unit plan shall at all times prior to production on any of the lands so committed remain subject to rental in accordance with § 3205.3.

§ 3205.4–2 After production.

As soon as production is obtained on or for any lands included in an approved cooperative or unit plan those lands which are included within the participating area of the producing well shall become liable for royalties in accordance with Subpart 3205. All other unitized lands, shall remain subject to rental in accordance with § 3205.3.

Subpart 3206—Lease Bonds

§ 3206.1 Types of bonds and filing.

§ 3206.1–1 Types of bonds.

(a) Bonds shall be either corporate surety bonds or personal bonds except that bonds with individual sureties may be furnished for the protection of the entryman or owner of the surface rights.

(b) Lease compliance bond. The applicant for a noncompetitive lease or the successful bidder for a competitive lease must furnish, prior to the issuance of the lease, and thereafter maintain a bond of not less than $10,000 conditioned on compliance with all the terms of the lease.

(c) Protection bond. A lessee will be required, prior to entry on the leased lands, to furnish and maintain a bond of not less than $5,000 for indemnification for all damages occasioned to persons or property as the result of lease operations.

§ 3206.1–2 Filing of bonds.

A single original copy of the bond on forms approved by the Director must be filed in the proper BLM office. Bonds may be filed with a noncompetitive lease application to expedite action thereon, or within 30 days after receipt of notice by the applicant of the bond requirement, or as required and directed by the authorized officer. For unit bond forms see 30 CFR Part 271.

§ 3206.2 Termination of period of liability.

The period of liability of any bond will not be terminated until all lease terms and conditions have been fulfilled.

§ 3206.3 Operator's bond.

§ 3206.3–1 Compliance.

An operator, or, if there are more than one for different portions of the lease, each operator may furnish a general lease bond of not less than $10,000 in his own name as principal on the bond in lieu of the lessee. Where there is more than operator's bond affecting a single lease, each such bond must be conditioned upon compliance with all lease terms for the entire leasehold.

§ 3206.3–2 Approval.

An operator's bond will not be accepted unless the operator holds an operating agreement which has been approved by the Department or has pending an operating agreement in proper condition for approval. The mere designation as operator will not suffice.

§ 3206.3–3 Default.

Where a bond is furnished by an operator, suit may be brought thereon without joining the lessee if he is not a party to the bond.

§ 3206.4 Personal bond or corporate bond.

§ 3206.4–1 Amount.

In lieu of a surety bond, a personal bond in a like amount may be given by the obligor with the deposit as security therefor of negotiable bonds of the United States of a par value equal to the amount specified in the bond.

§ 3206.4–2 Deposit of securities.

Personal bonds must be accompanied by a deposit of negotiable Federal securities in a sum equal at their par value to the amount of the bond and by a proper conveyance to the Secretary of full authority to sell such securities in case of default in the performance of the conditions of the lease bond.

§ 3206.4–3 Qualified corporate sureties.

Treasury lists. A list of companies holding certificates of authority from the Secretary of the Treasury under the Act of July 30, 1947 (6 U.S.C. 6–13), as acceptable sureties on Federal bonds is published in the FEDERAL REGISTER annually.

§ 3206.5 Nationwide bond.

In lieu of bonds required under any of the preceding paragraphs, the holder of leases or of operating agreements approved by the Department or holder of operating rights by virtue of being designated operator or agent by the lessee pending departmental approval of operating agreements may furnish a bond the amount of which must be not less than $150,000 for full nationwide coverage for all geothermal leases.

§ 3206.6 Statewide bond.

In lieu of any of the bonds required by the preceding paragraphs, the holder of leases or of operating agreements approved by the Department or holder of operating rights by virtue of being designated operator or agent by the lessee

pending Departmental approval of operating agreements, may furnish a statewide bond, applicable to the State in which the leases are situated, the amount of which must be not less than $50,000.

§ 3206.7 Default.

§ 3206.7–1 Payment by surety.

Where upon a default the surety makes payment to the Government of any indebtedness due under a lease, the face amount of the surety bond and the surety's liability thereunder shall be reduced by the amount of such payment.

§ 3206.7–2 Penalty.

Thereafter, upon penalty of cancellation of all of the leases covered by that bond, the principal shall post a new nationwide bond in the amount of $150,000 or a new statewide bond in the amount of $50,000 as the case may be, within 6 months after notice, or within such shorter period as the authorized officer may fix. However, in lieu thereof, the principal may within that time file separate bonds for each lease.

§ 3206.8 Applicability of provisions to existing bonds.

The provisions of these regulations may be made applicable to any oil and gas nationwide or statewide bond in force at the effective date of these regulations by filing in the proper BLM office a written consent to that effect and an agreement to be bound by the provisions hereof executed by the principal and the surety. Upon receipt thereof the bond will be deemed to be subject to the provisions of these regulations.

Subpart 3207—[Reserved]

Subpart 3208—[Reserved]

Subpart 3209—Geothermal Resources Exploration Operations

§ 3209.0–1 Purposes.

(a) The regulations in this Subpart establish procedures to be followed in conducting exploration operations on the public land for geothermal resources. The regulations in this subpart are not applicable to exploration operations conducted pursuant to a geothermal resources lease.

(b) The rights obtained under this subpart do not include an exclusive right to prospect for geothermal resources on the land described in a Notice of Intent or any preference right to a geothermal resources lease.

§ 3209.0–2 Objectives.

The regulations in this Subpart encourage exploration of the public lands for geothermal resources in a manner that is consistent with the management policy set forth in § 1725.3 of this chapter. No exploration operations will be allowed if the authorized officer determines that such operations would be inconsistent with that policy. The authorized officer may suspend or terminate exploration operations upon due notice to the operator at any time if he determines that there is non-compliance with the terms and conditions of the Notice of Intent.

§ 3209.0–5 Definitions.

As used in this subpart:

(a) "Exploration operations" means any activity relating to the search for evidence of geothermal resources which requires physical presence upon public lands and which may result in damage to public lands or resources thereon. It includes, but is not limited to, geophysical operations, drilling of shallow temperature gradient wells, construction of roads and trails, and cross-country transit by vehicle over public lands. It does not include the casual use of public lands for geothermal resources exploration. It does not include core drilling for subsurface geologic information, except drilling of shallow temperature gradient wells, or drilling for geothermal resources; these activities will be authorized only by the issuance of a geothermal resources lease. The regulations in this Subpart, however, are not intended to prevent drilling operations necessary for placing explosive charges for seismic exploration, nor do they affect the exclusive right of a lessee to drill for geothermal resources upon the land subject to his lease.

(b) "Notice of Intent" means a "Notice of Intent and Permit to Conduct Exploration Operations (Geothermal Resources)."

(c) "Public lands" means lands owned by the United States and administered by the Bureau of Land Management. It does not include a retained mineral interest in lands, title to which has passed from the United States.

(d) "Casual use" means activities that involve practices which do not ordinarily lead to any appreciable disturbance or damage to lands, resources, and improvements. For example, activities which do not involve use of heavy equipment or explosives and which do not involve vehicle movement except over established roads and trails are "casual use."

§ 3209.1 Notice of intent and permit to conduct exploration operations (Geothermal Resources).

§ 3209.1–1 Application.

(a) *Forms and where filed.* Any persons desiring to conduct exploration operations under the regulations of this subpart shall, prior to entry upon the lands, file for approval with the authorized officer for the district in which the public lands are located a Notice of Intent on a form approved by the Director.

(b) *Requirements.* The Notice of Intent will contain the following:

(1) The name and address, including zip code, both of the person, association, or corporation for whom the operations will be conducted and of the person who will be in charge of the actual exploration activities;

(2) a statement that the signers agree that exploration operations will be conducted pursuant to the terms and conditions listed on the approved form;

(3) a brief description of the type of operations which will be undertaken;

(4) a description of the lands to be explored by township;

(5) a map or maps, available from state or Federal sources, showing the lands to be entered or disturbed by the proposed exploration operations; and

(6) the approximate dates of the commencement and termination of exploration operations.

§ 3209.1–2 Review of Notice of Intent.

The authorized officer will either approve or disapprove a Notice of Intent as promptly as practicable, but in any event within 30 calendar days after the date of the filing of the Notice of Intent. If the authorized officer shall disapprove a Notice of Intent, he shall explain in writing to the applicant the reasons for disapproval.

§ 3209.2 Exploration operations.

No exploration operations will be conducted on public lands except pursuant to the terms of a Notice of Intent which has been approved by the authorized officer.

§ 3209.3 Completion of operations.

Upon completion of the exploratory operations, there shall be filed with the authorized officer a "Notice of Completion of Exploration Operations." Within 90 days after the filing of such "Notice of Completion," the authorized officer shall notify the party who had conducted compliance with all of the terms and conditions set out by the regulations in this Subpart and in the Notice of Intent, or whether any additional measures must be taken to rectify any damage to the land, specifying the nature and extent thereof.

§ 3209.4 Bond requirement.

§ 3209.4–1 General.

(a) Simultaneously with the filing of the Notice of Intent, and before the entry is made on the land, the party or parties filing the Notice of Intent must file with the authorized officer a surety company bond for each exploration operation in the amount of not less than $5,000, conditioned upon the full and faithful compliance with all of the terms and conditions of the regulations in this Subpart and of that Notice of Intent.

(b) A party will be excused from compliance with the requirements of paragraph (a) of this section if he possesses either a nationwide bond in the amount of not less than $50,000 covering all exploration operations or a statewide bond in the amount of not less than $25,000 covering all exploration operations in the State in which the lands on which he has filed the Notice of Intent are situated.

§ 3209.4–2 Riders to existing bond forms.

Holders of nationwide and statewide oil and gas exploration bonds shall be permitted, in lieu of furnishing additional bonds, to amend their bonds to include geothermal resources exploration operations.

§ 3209.4–3 Termination of period of liability.

The authorized officer will not give his consent to the cancellation of the bond if an individual bond was submitted or to the termination of the period of liability if a State or nationwide bond was submitted, unless and until there has been compliance with all of the terms and conditions of the Notice of Intent. Should the authorized officer fail to notify the party within 90 days from the filing of "Notice of Completion" that all terms and conditions have been complied with or that additional corrective measures must be taken to rehabilitate the land, the period of liability under an individual bond or the period of liability for a particular exploration operation under a State or nationwide bond shall automatically terminate on the 91st day.

PART 3210—NONCOMPETITIVE LEASES

Subpart 3210—Noncompetitive Leases; General

Sec.

Subpart 3211—Bureau Motion, Lands Previously Leased for Geothermal Resources

Subpart 3210—Noncompetitive Leases; General

§ 3210.1 Availability of land.

(a) Applications to lease, except for those filed pursuant to Part 3230, of this chapter, filed prior to the effective date of these regulations are unacceptable and will be returned summarily without earning any priority.

(b) Lands and deposits subject to disposition under this part which are not within any KGRA will be available for leasing after the effective date of these regulations. Lands which are available for noncompetitive leasing and which were included in cancelled, relinquished, expired, or terminated leases shall be available for leasing only subject to the provisions of Subpart 3211 of this chapter. All other lands available for noncompetitive leasing will be available for leasing only subject to the provisions of this Subpart. All applications to lease the same lands which are filed between the effective date of these regulations and 30 days following that time will be considered to have been filed simultaneously, and the respective priority of the various applications will be determined by a public drawing. In other respects the first 30 days after the effective date of these regulations shall be treated as an application filing period as provided in § 3210.2–2.

§ 3210.2–1 Application.

An application for a lease must be filed on a form approved by the Director in the proper BLM office in duplicate for public lands and in triplicate where acquired lands are involved. The application must be submitted in a sealed envelope marked "Application for lease pursuant to 43 CFR 3210". An application will be considered filed when it is received in the proper office during business hours. The application must include the following:

(a) The applicant's name and address;

(b) a statement of applicant's citizenship and qualifications;

(c) a complete and accurate description of the lands applied for, which must include all available lands, including reserved geothermal resources, within a surveyed or protracted section, or, if the lands are neither surveyed or protracted and are descriped by metes and bounds, all the lands which will be included in a section when the lands are surveyed or protracted;

(d) a proposed plan which shall include: (1) A map, or maps, available from State or Federal sources, showing the topography of the land applied for, on which the applicant shall show drainage patterns, present road and trail locations, present utility systems, proposed road and trail location, proposed well locations and potential surface disturbance, and (2) a narrative statement setting forth his proposed plan and methods for diligent exploration. Such plan shall provide for a program of diligent exploration as defined in § 3203.5 of this chapter.

The narrative statement shall also describe the measures proposed to be taken to prevent or control fire, soil erosion, pollution of surface and ground water, damage to fish and wildlife or other natural resources, air and noise pollution and hazards to public health and safety during lease activities. However, the proposed plan required by this paragraph need not be submitted with the application during the initial 30-day simultaneous filing period provided by § 3210.1(b) or during any application filing period pursuant to § 3210.2–2, but must be filed prior to the issuance of the lease, upon notice from the authorized officer; and

(e) a statement that the applicant does not hold, own, or control any interest, direct or indirect, in other Federal geothermal leases in the same State in excess of 20,480 acres.

§ 3210.2–2 Submission of applications.

Except for applications filed during the first 30 days after the effective date of these regulations, applications for leases pursuant to this subpart shall submitted only during application filing periods. An application filing period shall begin on the first working day of each calendar month and shall end at the close of business on the last working day of that month. The first application filing period shall begin on the first working day of the month following the conclusion of the initial 30 day filing period provided in § 3210.1(b). No applicant shall file during the same application filing period a second application which overlaps any of the land covered by his first application. When an application is filed with the authorized officer, the date of filing shall be stamped on the envelope. The envelope containing the application shall remain sealed until the end of the application filing period during which the application is filed. On the first working day following the end of the application filing period all applications shall be opened, and it will be determined which applications are for lands included in a KGRA. In determining whether land included in an application is a KGRA because of competitive interest, no application submitted during any subsequent application filing period will be considered. Applications for land determined to be KGRA will be rejected. All other applications will be assigned priority according to the date of filing. If any application covers both land within a KGRA and land outside a KGRA, the applicant will be granted the opportunity to amend his application to exclude the portion included in a KGRA, and his amended application will be assigned priority according to the date of filing of his original application, but must comply with all other requirements of these regulations.

§ 3210.2–3 Withdrawal of application

An application may not be withdrawn, either in whole or in part, unless the request is received by the proper BLM office before the lease or an amendment of the lease, whichever covers the land described in the withdrawal, has been signed on behalf of the United States even though the effective date of the lease is subsequent to the date of filing of the withdrawal, except where a separate conflicting lease has been signed on behalf of the United States covering the land described in the withdrawal.

§ 3210.2–4 Amendment to lease.

If any of the land applied for was open to filing when the application was filed but is omitted from the lease for any reason and thereafter becomes available for noncompetitive leasing, the original lease will be amended to include the omitted land unless, before the issuance of the amendment, the proper BLM office receives a withdrawal of the lessee's application with respect to such land or such omitted lands have been determined to be within a KGRA. The lease term for the land added by such an amendment shall be the same as if the land had been included in the original lease when it was issued.

§ 3210.3 Determination of priorities.

(a) No lease shall be issued before final action has been taken on (1) any prior application to lease the land, (2) any subsequent application to lease the land that is based upon a claimed preferential

right, and (3) any petition for the renewal or reinstatement of an existing or former lease on the land.

(b) Where a lease is issued before final action has been taken on such applications and petitions, it shall be canceled, and the advance rental returned, after due notice to the lessee, where the applicant or petitioner is found to be qualified and entitled to receive a lease of the land.

(c) Applications for lease received in the mail or delivered on the same day will be deemed to have been simultaneously filed, and the right of priority and the order of processing will be determined by a public drawing.

(d) Prior to the issuance of any lease, a determination shall be made as to whether or not the lands are within a KGRA. Applications for lands determined to be within any KGRA will be rejected.

§ 3210.4 Rejections.

If, after the filing of an application for a noncompetitive lease and before the issuance of a lease, or amendment thereto, pursuant to that application, the land embraced in the application becomes included within a KGRA, the application will be rejected as to such KGRA lands. The authorized officer retains discretion to reject an application for a noncompetitive lease even though the tract for which application is made is not determined to be within a KGRA.

Subpart 3211—Bureau Motion—Land Previously Leased for Geothermal Resources

§ 3211.1 Releasing of formerly leased lands.

Lands available for noncompetitive leasing in canceled or relinquished leases or in leases which expire by operation of law at the end of their primary or extended terms or in leases which terminate by operation of law for nonpayment of rental pursuant to 30 U.S.C. sec. 1004, shall be subject to further leasing only in accordance with the provisions of this section. From time to time the authorized officer will publish in the FEDERAL REGISTER, post in each proper BLM office, and provide appropriate news coverage of:

(a) A list of leasing units composed of lands which are available for noncompetitive leasing and which were in canceled, expired, relinquished, or terminated leases.

(b) An announcement that applications for leases on such lands will be received after a specific hour and date and that any applications filed during a specified simultaneous filing period beginning at that time will be regarded as simultaneously filed;

(c) The address of the proper BLM office where applications must be filed and where the terms and conditions under which the lease will be issued are available; and

(d) Requirements for a complete application, indicating that the proposed plan of operation, as required by § 3210.-2-1(d) of this chapter, will not be required until there has been a drawing and a consequent determination of priority, but must be filed prior to the issuance of the lease, upon notice from the authorized officer.

§ 3211.2 Applications during simultaneous filing periods.

(a) An application shall conform to the requirements of § 3210.2-1 of this chapter, except as provided below.

(b) Only one complete leasing unit, identified by unit number, may be included in an application. Lands not on the published list may not be included in the application.

(c) An applicant is permitted to file only one application for each numbered unit on the posted list. Submission of more than one application by or on behalf of the applicant for any unit on the posted list will result in the disqualification of all applications submitted by that applicant for the drawing to be held for that particular unit.

(d) The application must be accompanied by a signed statement that the applicant will furnish the information required by these regulations within 15 days after notification that his application is the only one for the tract, or that he is the successful drawee.

(e) Each application filed during a simultaneous filing period must be submitted in a sealed envelope marked "Application for a lease pursuant to 43 CFR subpart 3211". The envelope will remain sealed until the end of the 30-day simultaneous filing period, at which time the application will be time-stamped simultaneously and serialized. A public drawing of all applications received during the simultaneous 30-day period will be held to determine respective priorities and order of processing.

(f) Applications filed during a simultaneous filing period are subject to the classification criteria established in § 3200.0-5(k) of this chapter, and will be considered as all filed the same day.

(g) The requirements of § 3210.2-1(d) of this chapter requiring a proposed plan of operation need not be satisfied for a complete application during the 30-day simultaneous filing period or during any future designated simultaneous filing period. Such plan must be filed by the successful drawee prior to the issuance of the lease, upon notice from the authorized officer.

(h) Each application must be accompanied by the service charge of $50. The first year's advance rental need not be submitted with the application. A lease may be issued to the first drawee qualified to receive a lease upon payment of the first year's rental. Rental must be received in the proper BLM office within fifteen days from the date of receipt of notice that such rental is due. The drawee failing to submit the rental payment within the time allowed will be automatically disqualified to receive the lease, and consideration will be given to the application of the drawee having the next highest priority in the drawing.

§ 3211.3 Issuance of leases for units on posted list.

(a) If more than one application is received during the simultaneous filing period for the same unit on the list posted pursuant to § 3211.1(a), all applications on that unit filed during that period will be considered simultaneously filed. Priority of filing for such units will be determined by a public drawing. Three applications will be drawn for each unit, and the order in which they are drawn will fix the order in which the successful drawee will be determined. Where less than three applications have been filed, all applications will be drawn to determine priority.

If the lands are determined not to be within any KGRA, a lease may be issued to the successful drawee upon his compliance with all applicable regulations, including those in Subpart 3210 of this chapter.

(b) If only one application is filed during the simultaneous filing period on a unit on the list posted pursuant to § 3211.1(a), a lease on that unit, if the land is not included within any KGRA, may be issued to the applicant, upon his compliance with all applicable regulations, including those in Subpart 3210 of this chapter.

(c) If no application is filed on a unit on the list posted pursuant to § 3211.1 (a) within the prescribed simultaneous filing period, the land in that unit, if not within a KGRA, will become available for leasing in accordance with Subpart 3210 of this chapter.

PART 3220—COMPETITIVE LEASES

Subpart 3220—Competitive Leases; General

Sec.

Subpart 3220—Competitive Leases; General

§ 3220.1 General.

(a) Lands within a KGRA, except as provided under § 3201.1 of this chapter, will be available for leasing on the effective date of these regulations.

(b) The authorized officer will accept nominations to lease, or may on his own motion from time to time call for nominations to lease. Nominations may be withdrawn at any time.

§ 3220.2 Nominations.

(a) Nominations will be submitted on a card approved by the Director.

(b) A nomination must be filed in the proper BLM office in duplicate for public lands and triplicate where acquired lands are involved and must include the following:

(1) The nominator's name and address;

(2) A statement of citizenship and qualifications for lease;

(3) A description of the lands; and

(4) A statement of the interests, direct or indirect, held in other Federal geothermal leases in the same State.

§ 3220.3 Publication of notice of lease sale.

Where the Secretary determines to offer lands for competitive leasing he will publish a notice of lease sale in a newspaper of general circulation in the area in which the lands to be leased are located once a week for 4 consecutive weeks, or for such other period as he may direct.

§ 3220.4 Contents of notice of lease sale.

The notice will specify the time and place of sale, the manner in which bids may be submitted, the description of the lands, and the terms and conditions of the sale, including royalty and rental rates.

The notice will indicate the proper BLM office where the terms and conditions under which the lease will be issued are available. The notice will also indicate that the proposed plan of operation, as required by § 3210.2–1(d) of this chapter, must be filed before a lease can be issued.

§ 3220.5 Bidding requirements.

(a) A separate identified sealed bid must be submitted for each lease unit. Each bidder must submit with his bid a certified or cashier's check, bank draft, money order or cash in the amount of one-half of the amount bid together with proof of qualifications as required by these regulations.

(b) All bidders are warned against violation of the provisions of Title 18 U.S.C. section 1860 prohibiting unlawful combination or intimidation of bidders.

§ 3220.6 Award of lease.

(a) All sealed bids shall be opened at the place, date, and hour specified in the notice. No bids will be accepted or rejected at that time.

(b) Leases will be awarded to the highest responsible qualified bidder, except as required under Part 3230 of this chapter.

(c) The right to reject any and all bids is reserved. If the authorized officer fails to accept the highest bid for a lease within 30 days after the date on which the bids are opened (or such longer period as may be needed to comply with § 3230.1–6 of this chapter), all bids for that lease will be considered rejected. Deposits on rejected bids will be returned.

(d) If the lease is awarded, three copies of the lease will be sent to the successful bidder who shall be required to execute them within 30 days from receipt thereof, to pay the first year's rental, the balance of the bonus bid, file the required bond or bonds, and submit the proposed plan of operation as required by § 3210.–2–1(d) of this chapter. When the three copies of the lease are executed by the successful bidder and returned to the authorized officer, the lease will be executed by the authorized officer and a copy will be mailed to the lessee.

(e) If the successful bidder fails to execute the lease or otherwise comply with the applicable regulations, his deposit will be forfeited and disposed of as provided in section 20 of the Act. In this event the lands will be reoffered when it is determined, in the opinion of the Secretary, that sufficient interest exists to justify a competitive lease sale.

PART 3230—RIGHTS TO CONVERSION TO GEOTHERMAL LEASES OR APPLICATION FOR GEOTHERMAL LEASES

Subpart 3230—Rights to Conversion to Geothermal Leases or Application for Geothermal Leases; General

Sec.

Subpart 3230—Rights to Conversion to Geothermal Leases or Application for Geothermal Leases

§ 3230.1 General.

§ 3230.1–1 Rights to conversion to geothermal leases.

Where lands were on September 7, 1965, subject to valid leases or permits issued under the Mineral Leasing Act of 1920, as amended and supplemented (30 U.S.C. 181–287), or the Mineral Leasing Act for Acquired Lands, as amended (30 U.S.C. 351–358), or subject to existing mining claims located on or prior to September 7, 1965, the lessees, permittees, or claimants, or their successors in interest, if qualified to hold geothermal leases, shall have the right, subject to certain limitations as hereinafter provided, to convert such leases, permits or claims to geothermal leases covering the same lands. Upon issuance of a geothermal lease based upon the exercise of conversion rights hereunder, such outstanding leases, permits, or mining claims shall be deemed to be terminated or relinquished, respectively.

§ 3230.1–2 Rights to conversion to applications for geothermal leases.

Where lands were subject to application for leases or permits under the mineral leasing laws referred to in § 3230.1–1 on September 7, 1965, the applicants may, subject to certain limitations as hereinafter provided, convert their applications to applications for geothermal leases having priorities dating from the time of filing such applications under said mineral leasing laws. Upon issuance of a geothermal lease based upon the exercise of conversion rights hereunder, such pending applications for leases or permits shall be deemed to be withdrawn.

§ 3230.1–3 Land in which minerals are reserved to the United States.

Where a right to one of the forms of conversion referred to in § 3230.1–1 or § 3230.1–2 is claimed as to lands the surface of which has passed from Federal ownership but in which the minerals have been reserved to the United States, final action on any claim to conversion rights under section 4 of the Act shall be held in abeyance until such time as the question of title to the geothermal resources in such lands has been resolved pursuant to the provisions of section 21(b) of the Act, unless the Secretary determines that it is in the public interest to make a determination of such claims at an earlier time, subject to the rights, if any, of surface owners.

§ 3230.1–4 Conflicting claims of rights to conversion to geothermal leases, or to applications for geothermal leases.

(a) Where there are conflicting claims of rights to conversion to geothermal leases based upon mineral leases, mineral permits, or mining claims embracing the same land, the date of issuance of the permit or lease or of recordation of the claim shall determine priority.

(b) Where there are rights to conversion to applications for geothermal leases based on applications for mineral leases or permits in conflict with rights to conversion to geothermal leases based upon mining claims embracing the same lands, the mining claim right to convert to a geothermal lease shall have priority. If the applicant for a geothermal lease based upon a mining claim fails to qualify for any reason, the application for an application for a geothermal lease is entitled to priority based on the date of filing the application for a mineral lease or permit.

§ 3230.1–5 Evidence required to qualify for grant of rights to conversion to geothermal leases, or to applications for geothermal leases.

(a) Any person claiming rights to conversion to a geothermal lease must show to the reasonable satisfaction of the authorized officer that substantial expenditures for the exploration, development or production of geothermal steam, but not associated geothermal resources, were made by the applicant who is seeking the conversion on the lands for which a lease is sought or on adjoining, adjacent or nearby lands, including both Federal and non-Federal lands. The substantial expenditures must have been

made prior to December 24, 1970, and either by the applicant seeking conversion or by his predecessors in interest.

(b) For purposes of these regulations, an application for a lease or a permit, filed pursuant to applicable mineral leasing acts, pending on September 7, 1965, which subsequently ripened into a lease or permit, and which remains outstanding or has either terminated, expired or been canceled or relinquished, retains the right to conversion to an application for a geothermal lease. Applications for a lease or permit, filed pursuant to applicable mineral leasing acts, pending on September 7, 1965, which were subsequently withdrawn, retain the right to conversion to an application for a geothermal lease. Leases or permits issued pursuant to the applicable mineral leasing acts and outstanding on September 7, 1965, which were subsequently terminated, expired, or were canceled or relinquished, retain the right to conversion to a geothermal lease.

§ 3230.1–6 Method of leasing to owners of conversion rights to geothermal leases, or to applications for geothermal leases.

(a) *Lands included within any KGRA*—(1) *Competitive lease.* Where lands have been included within any KGRA prior to the issuance of a lease, the owner of a conversion right to a geothermal lease for such lands shall be entitled to the issuance of a competitive lease only in accordance with the provisions of subparagraph (2) of this paragraph. If the lands subject to a conversion right to a geothermal lease are in part within a KGRA and in part outside a KGRA, the holder of that conversion right shall have the right to divide his conversion right into two separate conversion rights so that he may receive a geothermal lease to the lands within the KGRA only subject to subparagraph (2) of this paragraph and a geothermal lease to the lands not within a KGRA subject to paragraph (b) of this section.

(2) *Preference right.* (i) Lands which have been included within any KGRA shall be leased only by competitive bidding in the manner prescribed in Subpart 3220 of this chapter, except that, in addition, the name and address of the applicant for any conversion right to a geothermal lease will be set forth in the lease sale notice.

(ii) The person owning the right to conversion to a geothermal lease shall be informed by written notice of the highest bona fide bid submitted for the lease at the sale. If within thirty (30) days after he has received that written notice, the person owning the right to conversion to a geothermal lease shall inform the authorized officer that he wishes such a lease, pay an amount equal to the highest bona fide bid submitted, pay the rental for the first year, file the required bond or bonds, and submit the data required by § 3210.2–1(d) and (e) of this chapter, a lease will be issued to him.

(iii) Failure of the owner of the right to conversion to a geothermal lease to inform the authorized officer timely will constitute a forfeiture of his conversion rights without further notice to him. In this event, the lease will be offered to the highest bona fide bidder, if otherwise qualified.

(iv) Where no bids are received, the person owning the right to conversion to a geothermal lease will not be awarded the lease. Failure of the owner of the right to conversion to submit a bona fide bid or to meet the high bid for the tract offered at the sale will constitute a forfeiture of his conversion right without further notice.

(b) *Lands not included within any KGRA—Noncompetitive lease.* Where lands have not been included within any KGRA prior to the issuance of a lease, the owner of a conversion right to a geothermal lease for such lands, if otherwise qualified, shall be entitled to the issuance of a noncompetitive lease for such lands.

(c) *Lands included within a KGRA*—(1) *Application for a lease.* Where lands have been included within a KGRA prior to the issuance of a lease, the owner of a conversion right to an application for a geothermal lease to those lands shall be entitled to receive a competitive geothermal lease only in accordance with the provisions of Subpart 3220 of this chapter. If the lands subject to a conversion right to a geothermal application are in part within a KGRA and in part outside a KGRA, the holder of that conversion right may amend his application to cover only the land outside the KGRA.

(2) *Preference right.* The owner of a conversion right to an application for a geothermal lease where the lands have been included within a KGRA shall receive no preference right to meet the highest bona fide bid.

(d) *Lands not included within any KGRA*—(1) *Application for a lease.* Where lands have not been included within a KGRA, the owner of a conversion right to an application for a geothermal lease, if otherwise qualified, shall be entitled to convert his right into an application for a non-competitive lease.

(2) *Preference right.* The owner of a conversion right to an application for a geothermal lease where the lands have not been included within a KGRA, if otherwise qualified, shall be entitled to the issuance of a non-competitive geothermal lease for such lands in accordance with Subpart 3210 of this chapter.

§ 3230.1–7 Acreage limitation.

No person shall be permitted to obtain, through conversion of mineral leases or prospecting permits, or applications therefor, or mining claims, leases for more than 10,240 acres, or a lease to any land not included in the lease, permit, application or claim converted, except that any such geothermal lease issued may include some lands not embraced in the lease, permit, application or claim on which the conversion right is based, where a metes and bounds description was used to describe lands in issued leases or permits or in filed applications or mining claim locations. In such event, the metes and bounds description will be conformed by the authorized office to a legal subdivision, to the extent possible.

§ 3230.2 Qualifications.

Persons who believe they are qualified under the Act to convert mineral leases or permits or existing mining claims to geothermal leases and persons who believe they are entitled to convert applications for mineral leases and permits to applications for geothermal leases shall comply with the procedures set forth below.

§ 3230.3 Applications.

§ 3230.3–1 Filing of application.

(a) A person seeking to convert a lease, permit, or application therefor, or a mining claim to a geothermal lease or application must have filed a written application on or before June 22, 1971. If such an application has been filed and does not contain the information specified in § 3230.3–2, such information must be supplied by the applicant within 60 days of the effective date of these regulations.

(b) Failure to have filed a conversion right application on or before June 22, 1971, will result in the loss of any such rights so claimed.

§ 3230.3–2 Statements required.

(a) An application based on a valid lease or permit referred to in section 3230.1–1 hereof shall include the date of issuance, the State in which the lands are located, and the serial number of the lease or permit. An application based on a mining claim referred to in § 3230.1–1 shall include the name, location, legal description or reference sufficient to identify the lands on the ground, date of location and date and place of recordation of the mining claim (including volume and page), which the applicant seeks to convert to a geothermal lease. An application based on an application for a mineral lease or permit referred to in § 3230.1–1 shall include the date the application for the lease or permit was filed with the Bureau of Land Management and the location of the proper BLM office where the application was filed, and should indicate the serial number assigned to the application.

(b) An application shall include a description of the lands sought to be included in a geothermal lease. If the lands have been surveyed under the public land rectangular survey system, each application shall describe the lands by legal subdivision, section, township, and range. If otherwise officially surveyed, the lands shall be described by the legal description, mining claim survey, or irregular tracts. If the lands have not been so surveyed, but protracted surveys for those lands have been approved and the effective date thereof published in the FEDERAL REGISTER, each application for lands shown on such protracted surveys, filed on or after such effective date, shall describe the lands according to the

legal subdivision, section, township, and range shown on the approved protracted surveys. If the lands have not been so surveyed, or included within approved protracted surveys, or it is otherwise appropriate, each application shall describe the lands by metes and bounds, giving courses and distances between the successive angle points on the boundary of the tract, and connected by courses and distances to a monument or to a prominent topographic feature.

(c) An application shall be accompanied by a detailed statement showing: (1) The expenditure made for the exploration, development, or production of geothermal steam, but not associated geothermal resources, on lands for which a geothermal lease is sought or on adjoining, adjacent or nearby Federal or non-Federal lands and the date or dates such expenditures were made, (2) the names and current addresses of the persons who actually performed the aforesaid exploration, development, or production work, (3) the geological, geophysical, and engineering data acquired in such exploration, development, or production which demonstrates, or tends to demonstrate the expenditures claimed, (4) a map showing the location where the expenditures and improvements were made, (5) a proposed plan as required by § 3210.2–1(e) of this chapter, and (6) a statement that he will be bound by the terms and conditions of a lease, if issued. The applicant shall file such additional information with respect to the application as requested by the authorized officer.

§ 3230.4 Conversion to geothermal leases or to applications for geothermal leases.

§ 3230.4–1 Processing and adjudicating applications.

Application for conversion to geothermal leases or to applications for geothermal leases together with all information and data submitted or requested by the authorized officer pursuant to § 3230.3–2 and any other pertinent available information or data shall be reviewed by the authorized officer to determine whether the required showing has been made, and thereafter the authorized officer shall prepare a proposed determination which shall be submitted to the Secretary, who will make a determination that the applicant has or has not satisfactorily shown that he is entitled to receive the grant of a geothermal lease, or application for a geothermal lease.

PART 3240—RULES GOVERNING LEASES

Subpart 3240—Rules Governing Leases

Subpart 3241—Assignments and Transfers

Sec.

Subpart 3242—Production and Use of Byproducts

Subpart 3243—Cooperative Conservation Provisions

Subpart 3244—Terminations and Expirations

Subpart 3241—Assignments and Transfers

§ 3241.1 Assignments, transfers, interests, qualifications.

§ 3241.1–1 Record title assignments or transfers of leases or undivided lease interests.

(a) The record title of leases may be assigned as to all or part of the leased acreage, except that no assignment will be approved where (1) either the assigned or retained portions created by the assignment would be less than 640 acres, unless the total acreage in the lease being partially assigned includes an irregular subdivision, as provided in § 3203.2 of this chapter in which case the assigned and retained portions may be less than 640 acres by an amount which is smaller than the amount by which the area would be more than 640 acres if the irregular subdivision were added, or (2) an undivided interest is created by assignment of a lease containing less than 640 acres, or (3) where the lease being assigned contains 640 acres or more, an undivided interest of less than 10 percent would be created in the leased acreage. An exception to the minimum acreage provision of this section may be made by the Secretary where he finds such exception is necessary in the interest of conservation of the resources.

(b) A working interest or operating right may be assigned, in accordance with this section, *Provided* That the assigned interest or right, divided or undivided, vests in the holder only the right to explore, develop and produce geothermal resources from the leased lands to the extent of not less than the interest assigned.

(c) All requests for approval of any assignment will be reviewed, prior to approval, to adjust environmental terms and conditions where necessary.

§ 3241.1–2 Qualifications.

(a) No assignment will be approved (1) if the assignee or any other party in interest is not qualified to take and hold a lease; (2) if a required bond is not filed; or (3) if the statement of interest required under § 3202.2–1(a) of this chapter is not filed.

(b) An assignment to a minor other than an heir or devisee of a lessee will not be approved.

(c) The assignment must be accompanied by a signed statement by the assignee either (1) that he is the sole party in interest in the assignment, or (2) setting forth the names and qualifications of the other parties holding interests in the lease. Where the assignee is not the sole party in interest, separate statements must be signed by each of the parties setting forth the nature and extent of the interest of each party and the nature of the agreement between them.

(d) Where an attorney-in-fact or agent signs, on behalf of the assignor or assignee, the instrument of transfer or the application for approval, evidence of the authority of the attorney-in-fact or agent to sign such assignment or application must be furnished to the authorized officer.

(e) For the heir or devisee of the deceased holder of a lease, an operating agreement, or an overriding royalty interest in a producing lease, to be recognized by the authorized officer as the holder of that lease, agreement or interest, the appropriate showing required under the regulations in § 3202.2–6 of this chapter must be furnished to the authorized officer.

§ 3241.2 Requirements for filing of assignments or transfers.

§ 3241.2–1 Place of filing and service charge.

A request for approval of any assignment or other instrument of transfer of a lease or interest therein must be filed

in the proper BLM office and accompanied by a nonrefundable service charge of $50. An application request not accompanied by payment of such a service charge will not be accepted for filing.

§ 3241.2–2 Number of copies required.

Three copies of all instruments of assignment or transfer, and a single copy of any additional information required by § 3202.2 of this Chapter relating to citizenship or qualification of corporations and associations, including partnerships, must be filed in the proper BLM office.

§ 3241.2–3 Time of filing assignments, transfers of leases, or undivided lease interests.

(a) Any assignment or instrument of transfer of a lease or of an interest therein, including an assignment of working interests, operating agreements, and operating rights, must be filed in the proper BLM office for approval within 90 days from the date of execution of that instrument and must contain all of the terms and conditions agreed upon by the parties thereto, together with evidence and statements similar to that required of an applicant under these regulations in this group.

(b) A separate instrument of assignment must be filed in the proper BLM office for each geothermal lease involving transfers of record title. When transfers to the same person, association, including partnerships, or corporation involve more than one geothermal lease, one request for approval and one showing as to the qualifications of the assignee will be sufficient.

§ 3241.2–4 Forms and statements.

A form approved by the Director, or unofficial copies of that form in current use, must be used for transfers and requests for approval referred to in this section and must be filed in duplicate for public lands and in triplicate where acquired lands are involved. The approved form may be used for an assignment which affects a transfer of the record title to all or part of a geothermal lease, but it is not to be used for any other type of transfer. The application for assignment shall be deemed to be approved upon execution by the authorized officer.

§ 3241.2–5 Description of lands.

Each instrument of transfer must describe the lands involved in the same manner as described in the lease.

§ 3241.3 Bonds.

Where an assignment does not create separate leases, the assignee, if the assignment so provides, may become a joint principal on the bond with the assignor. Any assignment which does not convey the assignor's record title in all of the lands in the lease must also be accompanied by consent of his surety to remain bound under the bond of record as to the lease retained by said assignor, if the bond, by its terms, does not contain such consent. If a party to the assignment has previously furnished a nationwide or statewide bond, no additional showing by such party is necessary as to the bond requirement.

§ 3241.4 Approval.

Upon approval, an assignment shall be effective as of the first day of the lease month following the date of filing of the assignment.

§ 3241.5 Continuing responsibility.

(a) The assignor and his surety will continue to be responsible for the performance of any obligation under the lease until the assignment is approved.

(b) Upon approval, the assignee and his surety shall be responsible for the performance of all lease obligations notwithstanding any terms in the assignment to the contrary.

§ 3241.6 Production payments.

If payments out of production are reserved, a statement must be submitted stating the details as to the amount, method of payment, and other pertinent items.

§ 3241.7 Overriding royalty interests.

§ 3241.7–1 General.

(a) Overriding royalty interests in geothermal leases constitute accountable acreage holdings under these regulations.

(b) If an overriding royalty interest is created which is not shown in the instrument of assignment or transfer, a statement must be filed in the proper BLM office describing the interest.

(c) Any such assignment will be deemed valid if accompanied by a statement over the assignee's signature that the assignee is a citizen of the United States, an association of such citizens, or a corporation organized under the laws of the United States or of one of the States or the District of Columbia, and that his interests in geothermal leases do not exceed the acreage limitations provided in these regulations.

(d) All assignments of overriding royalty interests must be filed for record in the proper BLM office within 90 days from the date of execution. Such interests will not receive formal approval.

§ 3241.7–2 Limitation of overriding royalties.

(a) Except as herein provided, an overriding royalty on the value of the output of all geothermal resources, or any of them, at the point of shipment to market may be created by assignment or otherwise: *Provided*, That, (1) the overriding royalty is not for less than one-fourth (¼) of 1 percent of the value of such output, and does not exceed 50 percent of the rate of royalty due to the United States as specified in the geothermal lease, or as reduced pursuant to such lease, and (2) the overriding royalty, when added to overriding royalties previously created, does not exceed the maximum rate established herein.

(b) The creation of an overriding royalty interest that does not conform to the requirements of paragraph (a) of this section shall be deemed a violation of the lease terms, unless the agreement creating overriding royalties provides (1) for a prorated reduction of all overriding royalties so that the aggregate rate of royalties does not exceed the maximum rate established in paragraph (a) of this section and (2) for the suspension of an overriding royalty during any period when the royalties due to the United States have been suspended pursuant to the terms of the geothermal lease.

§ 3241.8 Lease account status; requirements.

Unless the lease account is in good financial standing as to the area covered by an assignment at the time the assignment and bond are filed, or is placed in good standing before the assignment is reached for action, the request for approval of the assignment will be denied, and the lease shall be subject to termination in accordance with these regulations.

§ 3241.9 Effect of assignment.

An assignment of the record title of the complete interest in a portion of the lands in a lease shall segregate the assigned and retained portions into separate and distinct leases. An assignment of an undivided interest in the entire leasehold shall not segregate the lease into separate or distinct leases.

Subpart 3242—Production and Use of Byproducts

§ 3242.1 General.

Where the Supervisor determines that production, use, or conversion of geothermal steam under a geothermal lease is susceptible of producing a valuable byproduct or byproducts, including commercially demineralized water contained in or derived from such geothermal steam for beneficial use in accordance with applicable State water laws, the authorized officer shall require substantial beneficial production or use thereof, except where he determines that:

(a) Beneficial production or use is not in the interest of conservation of natural resources;

(b) beneficial production or use would not be economically feasible; or

(c) beneficial production and use should not be required for other reasons satisfactory to him.

§ 3242.2 Production and use of commercially demineralized water as a byproduct, production, and use of other sources of water.

§ 3242.2–1 General.

Except as provided in these regulations, or the lease, the lessee shall have the right to process fluids, including brine, condensate, and other fluids, which are associated with geothermal steam within lands subject to the geothermal lease for the purpose of developing, producing, and utilizing the commercially demineralized water recovered as a result of such processing.

§ 3242.2–2 Prohibition on production of commercially demineralized water.

The lessee shall not be authorized to engage in the primary production of commercially demineralized water from the produced fluids contained in or derived from geothermal steam referred to in § 3242.2–1, where such use would result in the undue waste of geothermal energy.

§ 3242.2–3 Water wells on geothermal areas.

All leases issued under these regulations shall be subject to the condition that, where the lessee finds only potable water in any well drilled for production of geothermal resources, the Secretary may, when the water is of such quality and quantity as to be valuable and useable for agricultural, domestic, or other purpose, acquire the well with casing installed in the well at the fair market value of the casing.

§ 3242.2–4 State water laws.

Nothing in these regulations shall constitute an express or implied claim or denial on the part of the Federal Government as to its exemption from State water laws.

Subpart 3243—Cooperative Conservation Provisions

§ 3243.1 Cooperative or unit plans.

To conserve the natural resources of any geothermal pool, field or like area more properly, lessees and their representatives may unite with each other or jointly or separately with others, in collectively adopting and operating under a cooperative or unit plan of development or operation or any geothermal resource area, or any part thereof (whether or not any part of that geothermal resource area is then subject to any cooperative or unit plan of development or operation). Applications to unitize shall be filed with the Supervisor who shall certify whether such plan is necessary or advisable in the public interest. The procedure in obtaining approval of a cooperative or unit plan of development, the provisions for the supervision of the cooperative or unit plan, and a suggested text of an agreement, are contained in 30 CFR Part 271.

§ 3243.2 Acreage chargeability.

All leases committed to any unit or cooperative plan approved or prescribed by the Supervisor shall be excepted in determining holdings or control for purposes of acreage chargeability. For the extension of leases committed to a unit plan, see Subpart 3203 of this part.

§ 3243.3 Communitization or drilling agreements.

§ 3243.3–1 Approval.

(a) The Supervisor is authorized, when separate tracts under lease cannot be independently developed and operated in conformity with an established well-spacing or well-development program, to approve, or to require lessees to enter into, communitization or drilling agreements providing for the apportionment of production or royalties among the separate tracts of land comprising the drilling or spacing unit for the lease, or any portion thereof, with other lands, whether or not owned by the United States, when in the public interest. Operations or production pursuant to such an agreement shall be deemed to be operations or production as to each lease committed thereto.

(b) Preliminary requests to communitize separate tracts shall be filed in triplicate with the Supervisor.

(c) Executed agreements shall be submitted to the Supervisor in sufficient number to permit retention of five copies after approval.

§ 3243.3–2 Requirements.

The agreement shall describe the separate tracts comprising the drilling or spacing unit, disclose the apportionment of the production or royalties to the several parties and the name of the operator, and shall contain adequate provisions for the protection of the interests of all parties, including the United States. The agreement must be signed by or in behalf of all interested necessary parties and will be effective only after approval by the Supervisor.

§ 3243.4 Operating, drilling, development contracts or a combination for joint operations.

§ 3243.4–1 Approval.

(a) The Secretary may on such conditions as he may prescribe, approve operating, drilling, or development contracts made by one or more geothermal lessees, with one or more persons, associations, including partnerships, or corporations whenever he shall determine that such contracts are required for the conservation of natural resources or in the best interest of the United States.

(b) Contracts submitted for approval under this section should be filed with the Supervisor together with enough copies to permit retention of five copies after approval.

(c) The authority of the Secretary to approve operating, drilling, or development contracts without regard to acreage limitations ordinarily will be exercised only to permit operators to enter into contracts with a number of lessees sufficient to justify operations on a large scale for the discovery, development, production, or transmission, transportation, or utilization of geothermal resources, and to finance the same.

§ 3243.4–2 Requirements.

(a) The contract must be accompanied by a statement showing all the interests held by the contractor in the area or field and the proposed or agreed plan of operation or development of the field. All the contracts held by the same contractor in the area or field should be submitted for approval at the same time, and full disclosure of the project made. Complete details must be furnished so the Secretary may have facts upon which to make a definite determination in accordance herewith and to prescribe the conditions on which approval of the contracts shall be made.

(b) The application must show a reasonable need for the contract and that it will not result in any concentration of control over the production or sale of geothermal resources which would be inconsistent with the antimonopoly provisions of law.

§ 3243.4–3 Acreage chargeability.

All leases operated under approved operating, drilling or development contracts shall be excepted in determining holdings or control for purposes of acreage chargeability.

Subpart 3244—Terminations and Expirations

§ 3244.1 Relinquishments.

(a) A lease, or any legal subdivision of the area covered by such lease, may be relinquished by the record title holder by filing a written relinquishment in triplicate in the proper BLM office, provided the partial relinquishment does not reduce the remaining acreage in the lease to less than 640 acres, except where a departure is occasioned by an irregular subdivision in which case the remaining leased acreage may be less than 640 acres by an amount which is smaller than the amount by which the area would be more than 640 acres if the irregular subdivision were added, and except that the minimum acreage provision of this section may be waived by the Secretary where he finds such exception is justified on the basis of exploratory and development data derived from activity on the leasehold. The relinquishment must: (1) Describe the lands to be relinquished as described in the lease; (2) include a statement as to whether the relinquished lands had been disturbed and if so whether they were restored as prescribed by the terms of the lease; (3) state whether wells had been drilled on the lands and if so whether they had been placed in condition for abandonment; and (4) furnish a statement that all moneys due and payable to workmen employed on the leased premises have been paid.

(b) A relinquishment shall take effect on the date it is filed, subject to the continued obligation of the lessee and his surety: (1) To make payments of all accrued rentals and royalties; (2) to place all wells on the land to be relinquished in condition for suspension of operations or abandonment; (3) to restore the surface resources in accordance with all regulations and the terms of the lease; and (4) to comply with all other environmental stipulations provided for by such regulations or lease. A statement must be furnished that all moneys due and payable to workmen employed on the leased premises have been paid.

§ 3244.2 Automatic terminations and reinstatements.

§ 3244.2–1 General.

Except as provided in § 3244.2–2 any lease will automatically terminate by operation of law if the lessee fails to pay

the rental on or before the anniversary date of such lease. However, if the time for payment falls upon any day in which the proper office to receive payment is not open, payment received on the next official working day shall be deemed to be timely. The termination of the lease for failure to pay the rental must be noted on the official records of the proper BLM office. Upon such notation the lands included in such lease will become subject to leasing as provided for in Subpart 3211 of this chapter.

§ 3244.2–2 Exceptions.

(a) *Nominal deficiency.* If the rental payment due under a lease is paid on or before its anniversary date but the amount of the payment is deficient and the deficiency is nominal, the lease shall not have automatically terminated unless the lessee fails to pay the deficiency within the period prescribed in a Notice of Deficiency, or by the due date, whichever is later. A deficiency is nominal if it is not more than $10 or one percentum (1%) of the total payment due, whichever is more. The authorized officer shall send a Notice of Deficiency to the lessee on an approved form. The Notice shall be sent by certified mail, return receipt requested, and shall allow the lessee 15 days from the date of receipt to submit the full balance due to the proper BLM office. If the payment called for in the notice is not made within the time allowed, the lease will have terminated by operation of law as of its anniversary date.

(b) *Reinstatements.* (1) Except as hereinafter provided, the authorized officer may reinstate a lease which has terminated automatically for failure to pay the full amount of rental due on or before the anniversary date, if it is shown to his satisfaction that such failure was either justifiable or not due to a lack of reasonable diligence on the part of the lessee; and a petition for reinstatement, together with the required rental, including any back rental which has accrued from the date of termination of the lease, is filed with the proper BLM office.

(2) The burden of showing that the failure to pay on or before the anniversary date was justifiable or not due to lack of reasonable diligence will be on the lessee. Reasonable diligence normally requires sending or delivering payments sufficiently in advance of the anniversary date to account for normal delays in the collection, transmittal, and delivery of the payment. The authorized officer may require evidence, such as post office receipts, of the time of sending or delivery of payments.

(3) Under no conditions will a lease be reinstated if (i) a valid lease has been issued prior to the filing of a petition for reinstatement affecting any of the lands covered by the terminated lease, or (ii) the interest in the lands has been withdrawn, disposed of, or has otherwise become unavailable for leasing. However, the authorized officer will not issue a new lease for lands covered by a lease which terminated automatically until 90 days after the date of termination.

(4) Reinstatement of terminated leases is discretionary with the Secretary. The basic criterion in accordance with which this discretion will be exercised is whether the Secretary would be willing to issue a lease if a new lease offer for the same land were under consideration.

§ 3244.3 Cancellation of lease for noncompliance with regulations or lease terms; notice; hearing.

A lease may be canceled by the authorized officer for any violation of these regulations, the regulations in 30 CFR Part 270, or the lease terms, 30 days after receipt by the lessee of notice from the authorized officer of the violation, unless (a) the violation has been corrected, or (b) the violation is one that cannot be corrected within the notice period and the lessee has in good faith commenced within the notice period to correct the violation and thereafter proceeds diligently to complete the correction. A lessee shall be entitled to a hearing on the matter of any such claimed violation or proposed cancelation of lease if a request for a hearing is made to the authorized officer within the 30-day period after notice. The procedures with respect to notice of such hearing and the conduct thereof, and with respect to appeals from decisions of Administrative Law Judges upon such hearings, shall follow insofar as practicable the procedural rules applicable to hearings and appeals in public lands cases within the jurisdiction of the Board of Land Appeals, Office of Hearings and Appeals, contained in Department Hearings and Appeals Procedures, Part 4 of this title. The period for correction of violation or commencement to correct a violation of regulations or of lease terms, as aforesaid, shall be extended to 30 days after the lessee's receipt of the Administrative Law Judge's decision upon such a hearing if the Administrative Law Judge shall find that a violation exists.

§ 3244.4 Expiration by operation of law.

Any lease for land on which, or for which under an approved cooperative or unit plan of development or operation, there is no production in commercial quantities, or a producing well, or actual drilling operations being diligently prosecuted, will expire at the end of its primary term without notice to the lessee. Notation of such expiration need not be made on the official records, but the lands previously covered by that expired lease will be subject to the filing of new applications for leases only as provided in these regulations.

§ 3244.5 Removal of materials and supplies upon termination of lease.

Upon the expiration of the lease, or the earlier termination thereof pursuant to this subpart, the lessee shall have the privilege at any time within a period of ninety (90) days thereafter of removing from the premises any materials, tools, appliances, machinery, structures, and equipment other than improvements needed for producing wells. Any materials, tools, appliances, machinery, structures, and equipment subject to removal, but not removed within the 90-day period, or any extension thereof that may be granted because of adverse climatic conditions during that period, shall, at the option of the Supervisor, become property of the lessor, but the lessee shall remove any or all such property where so directed by the lessor.

NOTE: Forms 3200–4 and 3200–1 filed as part of the original document. Copies of these forms may be obtained by writing Geothermal Coordinator, Department of the Interior, Washington, D.C. 20240.

Dated: December 17, 1973.

W. W. LYONS,
Deputy Under Secretary of the Interior.

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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CONSERVATION DIVISION

GEOTHERMAL RESOURCES OPERATIONAL ORDER NO. 1

Effective February 1, 1975

EXPLORATORY OPERATIONS

This Order is established pursuant to the authority prescribed in 30 CFR 270.11 and in accordance with 30 CFR 270.78. All exploratory operations other than drilling of exploratory and development wells will be conducted in accordance with the provisions of this Order. All plans for exploratory operations to be conducted shall include provisions for appropriate environmental protection and reclamation of disturbed lands. A cultural resources investigation approved by the Area Geothermal Supervisor (Supervisor) shall be performed prior to any surface disturbance other than Casual Use.

All variances from the requirements specified in this Order shall be subject to approval pursuant to 30 CFR 270.48. Each Notice of Intent to Conduct Geothermal Resources Exploration Operations shall include a notation of any proposed variances from the requirements of this Order. References in this Order to approvals, determinations, or requirements are to those given or made by the Supervisor or his delegated representative.

The following exploratory operations and reasonable expenditures therefor will qualify as diligent exploration if approved by the Supervisor prior to the initiation of such operations.

1. Casual Use. Casual Use shall include any entrance on the leased lands for geological reconnaissance or surveying purposes. Sampling of springs and water wells on the lease for geochemical analysis shall be construed as casual use. Such non-disturbing surveys and reconnaissance operations will not require a Notice of Intent to Conduct Geothermal Resources Exploration Operations. The lessee shall notify the Supervisor prior to commencing such casual use operations. Casual Use operations proposed or completed shall be included in any subsequent Plan of Operations.

2. Geophysical Exploration. Geophysical exploration shall include, but is not limited to, surface electrical resistivity surveys, seismic ground noise surveys, passive micro-earthquake monitoring surveys, magneto-telluric surveys and all other geophysical surveys, including airborne techniques.

Geophysical surveys other than airborne techniques will require a Notice of Intent to Conduct Geothermal Resources Exploration Operations, (Form 3200-9). All such anticipated surveys should be included in the Plan of Operations and must be approved by the Supervisor before the work is begun.

The lessee shall furnish the Supervisor two copies of the records of such surveys within 30 days after the completion of such operations.

3. Drilling of Shallow Holes. Drilling of shallow holes for the measurement of temperature gradients or heat flow will be considered as an exploration operation and will require approval of a Notice of Intent to Conduct Geothermal Resources Exploration Operations (Form 3200-9) by the Supervisor. The following stipulations shall apply to the drilling of such shallow holes:

A. Holes for measuring temperature gradients shall be limited to a depth of 152 metres (500 feet), unless otherwise authorized by the Supervisor.

B. Return-line temperatures shall be taken at no less than 9-metre (30 foot) intervals during drilling operations on shallow holes drilled with mud. If return-line mud temperature should reach 52°C. (125°F.), drilling ahead shall cease immediately and the hole will be either

(1) Completed as an observation hole by running steel tubing as deep as possible, filling the annulus with drilling mud from total depth to 3 metres (10 feet) below the surface and with cement from 3 metres (10 feet) to the surface;

(2) Abandoned by filling the hole with drilling mud from total depth to 3 metres (10 feet) below the surface and cement to the surface thereafter, or

(3) Equipped with mud cooling and wellhead control devices to maintain well control and mud returns temperature at or below 52°C. (125°F.).

C. If flowing steam or hot water at 65°C (150°F.) or greater is encountered, further drilling shall stop immediately and the hole will be either

(1) Completed as an observation hole using steel tubing cemented from total depth to surface; or

(2) Abandoned by plugging with cement from total depth to surface.

D. If cold flowing artesian water is encountered, the hole will be completed as in (C) hereinabove, except that plastic tubing may be used.

If the conditions outlined in (B), (C) or (D) are encountered, the Supervisor shall be notified immediately.

No exceptions to the stipulations of (B), (C) or (D) will be allowed without specific prior permission of the Supervisor.

E. The lessee shall submit the following information with the Notice of Intent to Conduct Geothermal Resources Exploration Operations (Form 3200-9):

(1) The approximate location (to the nearest 30 metres (100 feet) from some identifiable marker or object within the smallest legal subdivision) and hole number or designation of each proposed hole and probable order of drilling;

(2) The type and size of drilling rig;

(3) The proposed drilling program including the drilling system (type of bit and circulating medium), approximate depths and casing (conductor) program for each such hole;

(4) The type of drilling sump and proposed method of sump abandonment at each location;

(5) The approximate time that each hole will be used for observation; and

(6) The proposed method of abandonment for each hole. Additionally, the lessee shall notify and receive the approval of the Supervisor prior to any change in the location of an approved hole or for any additional holes which the lessee desires to drill.

F. Locations proposed in natural thermal areas within a 300-metre (1,000-foot) radius of hot springs, fumaroles, or other surface geothermal indicia, or in areas of known artesian water flow, will require a detailed drilling program for each hole, approved by the Supervisor. The Supervisor may require special drilling and completion techniques for such holes (such as cemented surface casing and simple expansion-type blowout preventers) to safely control formations containing geothermal or other resources which may be penetrated.

G. A supply of mud and lost circulation material shall be kept on hand while drilling to control abnormal pressure if rotary equipment is used.

H. Holes shall be completed for observation purposes in a manner which will allow satisfactory subsequent abandonment. As a minimum, the annular space shall be filled with mud (cuttings and dirt if drilled with air or auger) to 3 metres (10 feet) below the surface and with cement from 3 metres (10 feet) to the surface, and the tubing shall be capped when not in use.

I. Holes shall be abandoned in a manner that will prevent subsurface interzonal migration of fluids and surface leakage. As a minimum, the top 3 metres (10 feet) of tubing below the surface shall be filled with cement. Tubing shall be cut off at ground level or as directed by the Supervisor.

4. Reporting Completion of Exploration Operations. The Notice of Completion of Geothermal Resources Exploration Operations (Form 3200-10) shall be submitted in triplicate, and shall include the following information for each hole drilled:

A. Final hole designation and location;

B. A driller's log noting water table and water aquifers encountered (if determined), and salt, coal beds or other mineral deposits, if present;

C. Method of completion, cementing, and casting and/or tubing used;

D. Complete details of the abandonment procedures;

E. Any information on drilling difficulties or unusual circumstances encountered which would be helpful in assuring future safety of operations or protection of the environment in the area concerned; and

F. Temperature data and logs for each hole surveyed.

5. General. Drilling fluids or cuttings shall not be discharged onto the surface where such discharge might contaminate lakes and perennial or intermittent streams. Excavated pits or sumps used in drilling shall be backfilled as soon as drilling is completed and restored to conform with the original topography. Unattended sumps shall be completely fenced for the protection of the public, domestic animals and wildlife.

6. Notice of Entry. Applicant shall contact the appropriate U. S. Geological Survey Geothermal District Office prior to entry on the land to conduct exploration operations.

Reid T. Stone
Area Geothermal Supervisor

Approved:

Russell G. Wayland,
Chief, Conservation Division

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CONSERVATION DIVISION

GEOTHERMAL RESOURCES OPERATIONAL ORDER NO. 2

Effective February 1, 1975

DRILLING, COMPLETION AND SPACING OF GEOTHERMAL WELLS

This Order is established pursuant to the authority prescribed in 30 CFR 270.11 and in accordance with 30 CFR 270.14, 270.15, and 270.40. All wells shall be drilled in such a manner as to minimize damage to the environment and to protect life, health, property, usable ground waters and geothermal resources.

All exploratory wells drilled for geothermal resources shall be drilled in accordance with the provisions of this Order. Initial development wells drilled for geothermal resources shall be drilled in accordance with the provisions of this Order, and these provisions shall continue in effect until field rules are issued. After field rules have been established by the Area Geothermal Supervisor (Supervisor), development wells in the individual fields shall be drilled in accordance with such rules.

Where sufficient geologic and engineering information is obtained through exploratory drilling, lessees may make application or the Supervisor may request the lessee to submit an application for the establishment of field rules. The Supervisor may issue field rules at any time he deems appropriate upon failure of the lessee to timely file for such field rules.

All wells drilled under the provisions of this Order shall have been included in an exploratory or development Plan of Operations as required under 30 CFR 270.34. Each Application for Permit to Drill (Form 9-331C) shall include all information required under 30 CFR 270.71, and shall include a notation of any proposed variances from the requirements of this Order. All variances from the requirements specified in this Order shall be subject to approval pursuant to 30 CFR 270.48. References in this Order to approvals, determinations, and requirements for submitting of information or applications for approval are to those granted, made or required by the Supervisor or his delegated representative. The lessee shall comply with the following requirements:

1. Well Casing. All wells shall be cased and cemented in accordance with the requirements of 30 CFR 270.15, and the application for permit to drill shall include the casing design safety factors for collapse, tension and burst. The permanent wellhead completion equipment shall be attached to the production casing or to the intermediate casing if the production casing does not reach to the surface except as otherwise authorized by the Supervisor to meet special well conditions. All casing strings reaching the surface shall be cemented at a sufficient

depth to provide adequate anchorage and support for the casing and any blowout prevention equipment required thereon. For the purpose of this Order, the several casing strings in order of normal installation are (1) conductor, (2) surface, (3) intermediate and (4) production strings. The following casing setting depth requirements are general in nature and subject to variations to permit the casing to be set and cemented in a competent formation. The Supervisor's determination of adequate casing setting depths shall be based upon all geologic and engineering factors including apparent geothermal gradients, depths and pressures of the various formations to be penetrated and all other pertinent information about the area. All depths in this Order refer to true vertical depth (TVD) below ground level, unless otherwise specified.

A. Conductor Casing. This casing shall be set at a minimum depth of 15 metres (50 feet) and a maximum depth of 60 metres (200 feet) before drilling into shallow formations suspected or known to contain geothermal resources, non-condensible gases, or other mineral resources or upon encountering such formations.

B. Surface Casing. This casing shall be set at a depth equivalent to or in excess of ten percent of the proposed total depth of the well provided, however, that such setting depth shall be not less than 60 metres (200 feet) nor more than 400 metres (1,300 feet).

C. Intermediate Casing. This casing shall be set at any time when required by well conditions encountered in drilling below the surface casing such as anomalous pressure zones, uncased fresh water aquifers, cave-ins, washouts, lost circulation zones, rapidly increasing thermal gradients or other drilling hazards. If a liner is used as an intermediate string, the lap shall be tested by a fluid entry or pressure test to determine whether a seal between the liner top and the next larger casing string has been achieved. The liner overlap shall be a minimum of 30 metres (100 feet). The test shall be recorded on the driller's log and may be witnessed by the Supervisor. In the event of lap or casing failure during the test, the lap or casing must be repaired or recemented and successfully retested as required by the Supervisor.

D. Production Casing. This casing may be set at the top of or through the potential producing zone and shall be set before completing the well for production. Production casing shall be run to the surface or lapped into the next larger casing string. The liner overlap, if utilized, shall be at least 30 metres (100 feet) and shall be tested, witnessed and recorded as in the case of intermediate casing hereinabove. In the event of lap or casing failure during the test, the lap or casing must be repaired or recemented and successfully retested as required

by the Supervisor. Production casing shall normally be of consistent nominal outside diameter from the surface or from the top of the lap to the casing shoe. The surface casing shall not be used as production casing, unless otherwise authorized by the Supervisor to meet special well conditions.

E. Cementing of Casing. The conductor and surface casing strings shall be cemented with a quantity of cement sufficient to fill the annular space back to the surface. The intermediate casing string shall likewise be cemented back to the surface or to the top of the lap if a liner is used as an intermediate string. Production casing shall be cemented with a high temperature resistant admix, unless waived by the Supervisor and shall be cemented in a manner necessary to exclude, isolate or segregate overlying formation fluids from the geothermal resources zone and to prevent the movement of fluids into possible fresh water zones. Production casing shall be cemented back to the surface or, if lapped, to the top of the lap. A temperature or cement bond log may be required by the Supervisor after setting and cementing the production casing and after all primary cementing operations if an unsatisfactory cementing job is indicated. Proposed well cementing techniques differing from the requirements of this paragraph will be considered by the Supervisor on an individual well basis.

F. Pressure Testing. Prior to drilling out the casing shoe after cementing, all casing strings set to a depth of 152 metres (500 feet) or greater, except for conductor casing, shall be pressure tested to a minimum pressure of 69 bars (1,000 psi) or 0.045 bars/metre (0.2 psi/ft) whichever is greater. All casing strings set at a depth less than 152 metres (500 feet), except for conductor casing, shall be pressure tested to a minimum pressure of 35 bars (500 psi). Such test shall not exceed the rated working pressure of the casing or the blow-out preventer stack assembly, whichever is lesser.

In the event of casing failure during the test, the casing must be repaired or recemented until a satisfactory test is obtained. A pressure decline of 10 percent or less in 30 minutes shall be considered satisfactory.

Casing test results shall be recorded on the driller's log and reported to the Supervisor within 30 days after the completion of such test. Advance notice of all casing and lap tests shall be given in sufficient time to enable the Supervisor to be present to witness such tests. The casing and lap test reports shall give a detailed description of the test, including mud and cement volumes, lapse of time between running and cementing casing and testing, method of testing and test results.

G. Directional Surveys.

(1) General. Deviation surveys (inclination from vertical or single shot) shall be taken on all wells during the normal course of drilling at intervals not to exceed 152 metres (500 feet). The Supervisor may require a directional survey giving both inclination and azimuth or a dipmeter to be obtained on all wells. In calculating all surveys, a correction from true north to Lambert-Grid north shall be made after making the magnetic to true north correction. All surveys shall be filed with the Supervisor. Where directional surveys are required, composite surveys shall be filed with the Supervisor showing the interval from the bottom of the conductor casing to total depth.

(2) Vertical Wells. Wells are considered vertical if inclination does not exceed an average of five degrees from the vertical. The Supervisor may require a directional survey giving both inclination and azimuth at intervals not exceeding 30 metres (100 feet) between stations prior to, or upon, setting any casing string or liner (except conductor casing) and at total depth on any vertical well drilled in close proximity to lease boundaries or areas with an unstable land surface, highly faulted or steeply dipping beds, or in areas of suspected abnormal formation pressures.

(3) Directional Wells. Wells are considered directional if inclination exceeds an average of five degrees from the vertical. Directional surveys giving both inclination and azimuth shall be obtained at intervals not to exceed 30 metres (100 feet) between stations prior to, or upon, setting any casing string or liner (except conductor casing) and at total depth.

2. Blowout Prevention Equipment and Procedures. All necessary precautions shall be taken to keep all wells under control at all times, utilize trained and competent personnel, and utilize properly maintained equipment and materials. Blowout preventers and related well control equipment shall be installed, tested immediately thereafter and maintained ready for use until drilling operations are completed. Certain components, such as packing elements and ram rubbers, shall be of high temperature resistant material as necessary. All kill lines, blowdown lines, manifolds and fittings shall be steel and shall have a temperature derated minimum working pressure rating equivalent to the maximum anticipated wellhead surface pressure. Subject to subparagraphs (A) and (B) hereinbelow blowout prevention equipment shall have manually operated gates and hydraulic actuating systems and accumulators of sufficient capacity to close all of the hydraulically-operated equipment and have a minimum pressure of 69 bars (1,000 psi) remaining on the accumulator. Dual control stations shall be installed with a high

pressure backup system. One control panel shall be located at the driller's station and one control panel shall be located on the ground at least 15 metres (50 feet) away from the wellhead or rotary table. Air or other gaseous fluid drilling systems shall have blowout prevention assemblies. Such assemblies may include, but are not limited to, a rotating head, a double ram blowout preventer or equivalent, a banjo-box or an approved substitute therefor and a blind ram blowout preventer or gate valve, respectively. Exceptions to the requirements of this paragraph will be considered by the Supervisor only for certain geologic and well conditions such as stable surface areas with known low subsurface formation pressures and temperatures.

A proposed blowout prevention program and a blowout contingency plan including proposed containment, public health and safety and clean-up measures shall be submitted with the Application for Permit to Drill (Form 9-331C).

A. Conductor Casing. Before drilling below this string, at least one remotely controlled hydraulically-operated expansion type preventer or an acceptable alternative, approved by the Supervisor, including a drilling spool with side outlets or equivalent, shall be installed. A kill line and blowdown line with appropriate fittings shall be connected to the drilling spool.

B. Surface, Intermediate and Production Casing. Before drilling below any of these strings, the blowout prevention equipment shall include a minimum of:

(1) One expansion-type preventer and accumulator or a rotating head;

(2) A manual and remotely controlled hydraulically-operated double ram blowout preventer or equivalent having a temperature derated minimum working pressure rating which exceeds the maximum anticipated surface pressure at the anticipated reservoir fluid temperature;

(3) A drilling spool with side outlets or equivalent;

(4) A fillup line;

(5) A kill line equipped with at least one valve; and

(6) A blowdown line equipped with at least two valves and securely anchored at all bends and at the end.

C. Testing and Maintenance. Ram-type blowout preventers and auxiliary equipment shall be tested to a minimum of 69 bars (1,000 psi) or to the working pressure of the casing or assembly, whichever is the lesser. Expansion-type blowout preventers shall be tested to 70

percent of the above pressure testing requirements.

The blowout prevention equipment shall be pressure tested:

(1) When installed;

(2) Prior to drilling out plugs and/or casing shoes;

(3) Not less than once each week, alternating the control stations; and

(4) Following repairs that require disconnecting a pressure seal in the assembly.

During drilling operations blowout prevention equipment shall be actuated to test proper functioning as follows:

(1) Once each trip for blind and pipe rams but not less than once each day for pipe rams; and

(2) At least once each week on the drill pipe for expansion-type preventers.

All flange bolts shall be inspected at least weekly and re-tightened as necessary during drilling operations. The auxiliary control systems shall be inspected daily to check the mechanical condition and effectiveness and to ensure personnel acquaintance with the method of operation. Blowout prevention and auxiliary control equipment shall be cleaned, inspected and repaired, if necessary, prior to installation to assure proper functioning. Blowout prevention controls shall be plainly labeled, and all crew members shall be instructed on the function and operation of such equipment. A blowout prevention drill shall be conducted weekly for each drilling crew. All blowout prevention tests and crew drills shall be recorded on the driller's log.

D. Related Well Control Equipment. A full opening drill string safety valve in the open position shall be maintained on the rig floor at all times while drilling operations are being conducted. A kelly cock shall be installed between the kelly and the swivel.

3. Drilling Fluid. The properties, use and testing of drilling fluids and the conduct of related drilling procedures shall be such as are necessary to prevent the blowout of any well. Sufficient drilling fluid materials to ensure well control shall be maintained in the field area readily accessible for use at all times.

A. Drilling Fluid Control. Before pulling drill pipe, the drilling fluid shall be properly conditioned or displaced. The hole shall be kept reasonably full at all times, however, in no event shall the annular mud level be deeper than 30 metres (100 feet) from the rotary table when coming out of the hole with drill pipe. Mud cooling techniques shall be utilized when necessary to maintain mud characteristics for proper well control and hole conditioning.

B. Drilling Fluid Testing. Mud testing and treatment consistent with good operating practice shall be performed daily or more frequently as conditions warrant. Mud testing equipment shall be maintained on the drilling rig at all times.

The following drilling fluid system monitoring or recording devices shall be installed and operated continuously during drilling operations, with mud, occurring below the shoe of the conductor casing. No exceptions to these requirements will be allowed without the specific prior permission of the Supervisor:

(1) High-low level mud pit indicator including a visual and audio-warning device;

(2) Degassers, desilters and desanders;

(3) A mechanical, electrical or manual surface drilling fluid temperature monitoring device. The temperature of the drilling fluid going into and coming out of the hole shall be monitored, read and recorded on the driller's or mud log for a minimum of every 9 metres (30 feet) of hole drilled below the conductor casing; and

(4) A hydrogen sulfide indicator and alarm shall be installed in areas suspected or known to contain hydrogen sulfide gas which may reach levels considered to be dangerous to the health and safety of personnel in the area.

C. Monitoring. From the time drilling operations are initiated and until the well is completed or abandoned, a member of the drilling crew or the toolpusher shall monitor the rig floor at all times for surveillance purposes, unless the well is secured with blowout preventers or cement plugs.

4. Well Logging. All wells shall be logged with an induction electric log or equivalent from total depth to the shoe of the conductor casing. The Supervisor may grant an exception to this requirement when well conditions make it impractical or impossible to meet the above requirements.

A. Electric Logs. The lessee shall furnish to the Supervisor two legible exact copies of all logs run, within 30 days after completion of drilling operations on each well. Two copies of field prints of such logs shall be made immediately available to the Supervisor upon his request. Two copies of chemical analyses of geothermal fluids or other similar services performed shall be submitted to the Supervisor within 30 days after such services are completed.

B. Lithologic Logs. Two legible exact copies of core analysis reports and lithologic (mud) logs shall be submitted to the Supervisor within 30 days after the completion of such reports or logs, when such services are used. However, daily logs shall be made available to the Supervisor immediately upon the completion of such daily logs upon his request.

5. Wellhead Equipment and Testing.

A. Completions. All wellhead connections shall be fluid pressure tested to the API or ASA working pressure rating. Cold water is recommended as the testing fluid. Welding of wellhead connections shall be performed by a certified welder using materials in conformance with ASTM specifications.

B. Wellhead Equipment. All completed wells shall be equipped with a minimum of one casinghead with side outlets, one master valve and one production valve, unless otherwise authorized by the Supervisor. All casingheads, Christmas trees, fittings and connections shall have a temperature derated working pressure equal to or greater than the surface shut-in pressure of the well at reservoir temperature. Packing, sealing mediums and lubricants shall consist of materials or substances that function effectively at, and are resistant to, high temperatures. Wellhead equipment, valves, flanges and fittings shall meet minimum ASA standards or minimum API Standard 6A specifications. Casinghead connections shall be made such that fluid can be pumped between casing strings.

C. Testing. Any well showing sustained casinghead pressure or leaking of geothermal fluids between casing strings shall be tested to determine the origin of the failure, when such failure point is not otherwise determinable, and corrective measures shall be taken.

6. Well Spacing. No producing interval of any well shall be located within 30 metres (100 feet) of the outer boundaries of the leased lands, except where approved by the Supervisor. No surface location of a well shall be located within 15 metres (50 feet) of the boundary of any legal subdivision unless otherwise authorized by the Supervisor. The Supervisor may approve or prescribe such well

spacing as he determines to be necessary for the proper development of the geothermal resources in accordance with the provisions of 30 CFR 270.15.

Reid T. Stone
Area Geothermal Supervisor

Approved:

Russell G. Wayland
Chief, Conservation Division

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CONSERVATION DIVISION

GEOTHERMAL RESOURCES OPERATIONAL ORDER NO. 3

Effective February 1, 1975

PLUGGING AND ABANDONMENT OF WELLS

This Order is established pursuant to the authority prescribed in 30 CFR 270.11 and in accordance with 30 CFR 270.14 and 270.45. The lessee shall comply with the following minimum plugging and abandonment procedures for all geothermal resources wells. Oral approvals shall be in accordance with 30 CFR 270.11. All variances from the requirements specified in this Order shall be subject to approval pursuant to 30 CFR 270.48. Each Sundry Notice (Form 9-331) shall include a notation of any proposed variances from the requirements of this Order. References in this Order to approvals, determinations or requirements are to those given or made by the Area Geothermal Supervisor (Supervisor) or his delegated representative.

The lessee shall promptly plug and abandon any well on the leased land that is not in use or demonstrated to be potentially useful. No well shall be abandoned until its lack of capacity for further profitable production of geothermal resources has been demonstrated to the satisfaction of the Supervisor. No well shall be plugged and abandoned until the manner and method of plugging have been approved or prescribed by the Supervisor.

Cement used to plug any geothermal resources well, except that cement or concrete used for surface plugging, shall be placed in the hole by pumping through drill pipe or tubing. Such cement shall consist of a high temperature resistant admix, unless this requirement is waived by the Supervisor in accordance with the particular circumstances existing in that well or area.

Prior to commencing abandonment operations, the Supervisor shall be notified of all such proposed operations.

Each Sundry Notice (Form 9-331) shall include all information required under 30 CFR 270.45 and 270.72. Any bond or rider thereto covering a lease or an individual well thereon, shall remain in full force and effect until the lease or individual well is properly abandoned and the surface properly restored. Written approval of the abandonment must be obtained from the Supervisor before release of any bonds will be recommended.

1. Permanent Abandonment.

A. Uncased Hole. In uncased portions of wells, cement plugs shall be placed to protect all subsurface mineral resources including fresh water aquifers. Such plugs shall extend a minimum of 30 metres

(100 feet) below, if possible, and 30 metres (100 feet) above such aforementioned zones. Cement plugs shall be placed in a manner necessary to isolate formations and to protect the fluids in such formations from interzonal migration or contamination.

B. Open Hole. Where there is open hole (uncased and open into the casing string above), a cement plug shall be placed in the deepest casing string by either (1) or (2) below. In the event lost circulation conditions exist or are anticipated, or if the well has been drilled with air or other gaseous substance, the plug shall be placed in accordance with (3) below.

(1) A cement plug shall be placed across the shoe extending a minimum of 30 metres (100 feet) above and 30 metres (100 feet) below; or

(2) A cement retainer with effective back pressure control set approximately 30 metres (100 feet) above the casing shoe with at least 61 metres (200 feet) of cement below the retainer and 30 metres (100 feet) of cement above.

(3) A permanent bridge plug set at the casing shoe and capped with a minimum of 61 metres (200 feet) of cement.

C. Perforations, Junk, Fish and Collapsed Pipe. A cement plug shall be placed across production perforations, extending 30 metres (100 feet) below (where possible) and 30 metres (100 feet) above the perforated interval. When a cement retainer is used to squeeze cement the perforated interval, the retainer shall be set a minimum of 30 metres (100 feet) above the perforations. Where the casing contains perforations at or below fish, junk or collapsed casing, thereby perventing cleanout operations, a cement retainer shall be set at least 30 metres (100 feet) above such point, and the interval below the retainer shall be squeeze cemented.

D. Casing Shoes, Stubs, Laps, and Liners. No casing shall be cut and recovered without first obtaining the written approval of the Supervisor. A cement plug shall be placed across all casing stubs, laps, liner tops and all casing shoes not protected by an inner casing string. Such plug shall extend a minimum of 15 metres (50 feet) below and 15 metres (50 feet) above any such shoe, stub, lap or liner top.

E. Plugging of Annular Space. All open annuli extending to the surface shall be plugged with cement.

F. Surface Plug. The innermost casing string which reaches ground level shall be cemented or concreted to a minimum depth of 15 metres (50 feet)measured from 2 metres (6 feet) below ground level.

G. Testing of Plugs. The hardness and location of cement plugs placed across perforated intervals and at the top of uncased or open hole shall be verified by setting down with tubing or drill pipe a minimum of 6,803 kilograms (15,000 pounds) weight on the plug or the maximum weight of the available tubing or drill pipe string, if less than 6,803 kilograms (15,000 pounds).

H. Mud. The intervals of the hole not filled with cement shall be filled with good quality heavy mud.

1. Surface Restoration. All casing strings shall be cut off at least 2 metres (6 feet) below ground level and capped by welding a steel plate on the casing stub. Cellars, pads, structures and other facilities shall be removed. The surface area shall be restored as specified by the Supervisor in consultation with the appropriate surface management agency.

2. Temporary Abandonment. An uncompleted drilling well that is to be temporarily abandoned shall be mudded and cemented as required hereinabove for permanent abandonment except for the provisions of subparagraphs E, F, and I.

3. Suspended Wells. The drilling equipment shall not be removed on any geothermal resources well where drilling operations have been suspended, either temporarily or indefinitely, without prior approval of the Supervisor and after approved measures have been taken to close the well and to protect all subsurface resources, including fresh water aquifers.

Reid T. Stone
Area Geothermal Supervisor

Approved:

Russell G. Wayland,
Chief, Conservation Division

Engineer's determination. Once the District Engineer has determined the proper method of disposal, the lessee or operator will have until October 1, 1977, or 60 days following receipt of the District Engineer's determination, whichever is the longer, in which to make any changes necessary to bring the disposal method into compliance.

V. *Unavoidable Delay*

A single extension of time not to exceed three months may be granted by the District Engineer where the lessee or operator conclusively shows by application that, despite the exercise of due care and diligence, he has been unable to timely comply with the requirements of this Notice, provided that such delay will not adversely affect the environment.

VI. *Reports*

All unauthorized discharges or spills from disposal facilities must be reported to the District Engineer in accordance with the provisions of NTL–3.

An annual report for each facility which includes the total volume disposed of during the reporting period and a current water analysis which provides the same type of information required for approval of the original application.

VII. *Compliance*

Compliance with this Notice does not relieve a lessee or operator of the responsibility for complying with more stringent applicable Federal or State water quality laws or regulations or with other written orders of the Geological Survey.

Date

Area Oil and Gas Supervisor.

APPROVED: RUSSELL G. WAYLAND,
Chief, Conservation Division.

[FR Doc.75–21475 Filed 8–14–75;8:45 am]

GEOTHERMAL RESOURCES OPERATIONAL (GRO) ORDER NO. 4

Central and Western Regions

Notice is hereby given that pursuant to 30 CFR 270.2, the Chief, Conservation Division, U.S. Geological Survey, has approved GRO Order No. 4 for the Central and Western Regions.

The purpose of GRO Order No. 4 is to provide General Environmental Protection Requirements for geothermal resources operations in the Central and Western Regions.

The proposed Order was published in the FEDERAL REGISTER on January 28, 1975, (Vol. 40, No. 19, pages 4166–4168), with a solicitation for comments. All comments on the proposed Order were considered in preparing the final version of GRO Order No. 4. In addition, the Geological Survey, on its own motion, has revised some sections of the proposed Order to strengthen and clarify it.

Significant modifications made in the draft Order and the rationale for them are as follows:

The introduction has been amended to reflect recent changes in the Freedom of Information Act (P.L. 89–487, as amended by P.L. 93–502), with respect to treatment of proprietary data submitted under this Order and to clarify the necessary acquisition of environmental baseline data one year prior to submission of a plan for production as required by 30 CFR 270.34(k).

Paragraph 2, LAND USE AND RECLAMATION, has been amended to consider vehicular traffic in environmentally fragile areas and temporary fencing, as needed, to facilitate revegetation in reclaimed areas.

Paragraph 4, RECREATION, has been amended to provide for the relocation of recreation sites and/or access routes thereto where such relocation is approved by the Supervisor with the concurrence of the Authorized Officer.

Paragraph 5, SLOPE STABILITY AND EROSION CONTROL, has been broadened to ensure that sites for wells and surface facilities in potentially unstable areas are designed by and constructed under the supervision of a qualified engineer or engineering geologist.

Paragraph 6, BIOTA, has been extensively revised and clarified with respect to soliciting expert advice and assistance from other Government agencies or private groups to detect adverse floral and faunal trends and to provide realistic mitigating measures. A section has been added which requires reasonable replacement of species or their habitat which are significantly damaged by a lessee's operations.

Paragraph 8, SUBSIDENCE AND SEISMICITY, has been broadened to include seismicity. The introduction has been reworded for clarification of surveying and data required.

Subparagraph 8B, BENCH MARKS, has been modified to include periodic resurveying of bench marks as necessary.

Subparagraph 8D, SEISMICITY, has been retitled and modified to require monitoring and remedial actions where production or injection results in induced seismicity.

Subparagraph 9A (1), LIQUID DISPOSAL, has been modified to allow liquid waste disposal by means other than injection if all applicable water quality standards are met.

Subparagraph 9A (3) has been retitled AIR QUALITY.

Subparagraph 9A (4), PITS AND SUMPS, has been reworded for clarification, and has been modified to require fencing of unattended pits and sumps when necessary to protect wildlife, livestock, and the public.

Subparagraph 9B (2), POLLUTION REPORTS, has been changed to eliminate distinction between "minor" and "substantial" spills, and now requires a uniform reporting procedure for all pollution incidents.

Subparagraph 9C (1), PLAN OF INJECTION, has been modified to eliminate the requirement that a lessee furnish a copy of his plan of injection to adjacent lessees.

Subparagraph 9C (3), INSPECTION, has been expanded to require the immediate cessation of injection operations in the event of an injection well failure which may damage surface or fresh water aquifers.

Paragraph 10, WATER QUALITY, has been clarified regarding water analysis requirements and to provide for a suspension of a production where a health hazard exists.

Subparagraph 11C, NOISE CRITERIA, has been clarified with respect to the conditions under which a noise level of 65 dB(A) may be exceeded.

It is hereby certified that the economic and inflationary impacts of Geothermal Resources Operational Order No. 4 have been carefully evaluated in accordance with OMB Circular A–107.

V. E. MCKELVEY,
Director.

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY CONSERVATION DIVISION

Geothermal Resources Operational Order No. 4

Effective August 1, 1975

General Environmental Protection Requirements

This Order is established pursuant to the authority prescribed in 30 CFR 270.11 and in accordance with 30 CFR 270.2, 270.34(k), 270.37, 270.41, 270.42, 270.43, 270.44, and 270.76. Lessees shall comply with the provisions of this Order. All variances from the requirements specified in this Order shall be subject to approval pursuant to 30 CFR 270.43. References in this Order to approvals, determinations, or requirements are to those given or made by the Area Geothermal Supervisor (Supervisor) or his delegated representative.

All data submitted under this Order shall be available for inspection in accordance with the Freedom of Information Act of 1966 (P.L. 89–487), as amended in 1974 (P.L. 93–502), except information such as geological, geophysical, reservoir, trade secrets, and financial data and interpretations of such data, maps, and related files for which a lessee requests proprietary status, provided that such status is determined by the Supervisor to be warranted and is approved by appropriate officials of the Department of the Interior.

Protection of the environment includes the lessee's responsibility to: conduct exploration and development operations in a manner that provides maximum protection of the environment; rehabilitate disturbed lands; take all necessary precautions to protect the public health and safety; and conduct operations in accordance with the spirit and objectives of all applicable Federal environmental legislation and supporting executive orders.

Adverse environmental impacts from geothermal-related activity shall be prevented or mitigated through enforcement of applicable Federal, State, and local standards, and the application of exist-

ing technology. Inability to meet these environmental standards or continued violation of environmental standards due to operations of the lessee, after notification, may be construed as grounds for the Supervisor to order a suspension of operations.

The lessee shall be responsible for the monitoring of readily identifiable localized environmental impacts associated with specific activities that are under the control of the lessee. Monitoring of environmental impacts may be conducted by the use of aerial surveys, inspections, periodic samplings, continuous recordings, or by such other means or methods as required by the Supervisor. Due to the differing natural environmental conditions among geothermal areas, the extent and frequency of such monitoring activities will be determined by the Supervisor on an individual basis. In the event the Supervisor determines that the degree and adequacy of existing environmental protection regulations in certain areas are insufficient, the Supervisor may establish additional and more stringent requirements by the issuance of field orders or by modifying existing orders.

Lessees shall provide for acquisition of environmental baseline data as required in accordance with 30 CFR 270.34 (k) for a period of one year prior to submission of a plan for production. Techniques and standards to be used by the lessee for meeting these requirements shall receive prior approval by the Supervisor. The lessee, in accordance with the requirements of 30 CFR 270.76, shall file in duplicate with the Supervisor, on or before March 1 of each year, an annual report of compliance with environmental protection requirements for the previous calendar year.

1. *Aesthetics.* The lessee shall reduce visual impact, where feasible, by the careful selection of sites for operations and facilities on leased lands. The design and construction of facilities shall be conducted in a manner such that the facilities will blend into the natural environmental setting of the area by the appropriate use of landscaping, vegetation, compatible color schemes, and minimum profiles. Native plants or other compatible vegetation shall be used, where possible, for landscaping and revegetation.

2. *Land Use and Reclamation.* Operating plans shall be designed so that operations will result in the least disturbance of land, water, and vegetation. Existing roads shall be used where suitable. Entry upon certain environmentally fragile land areas, as designated by the surface management agency, may be either seasonally restricted or restricted to special vehicles or transportation methods which will minimize disturbance to the surface or other resources as specified by the Supervisor and surface management agency.

Operating plans shall provide for the reclamation and revegetation of all disturbed lands in a manner approved by the Supervisor and the appropriate surface management agency. Land reclamation may include preparation and seeding with prescribed wildlife food and plant cover or improved and acceptable substitutes thereof which will equal or enhance the food values for indigenous wildlife species and domesticated animals. Temporary fencing for such reclaimed areas may be required to facilitate restoration thereof.

The lessee shall at all times maintain the leased lands in a safe and orderly condition and shall perform the operations in a workmanlike manner. The lessee shall remove or store all supplies, equipment, and scrap in a timely and orderly fashion.

Operations under a geothermal lease shall not unreasonably interfere with or endanger operations under any other lease, license, claim, permit, or other authorized use on the same lands.

3. *Public Access.* The public shall have free and unrestricted access to geothermal leased lands, excepting however, where restrictions are necessary to protect public health and safety or where such public access would unduly interfere with the lessee's operations or the security thereof. The lessee shall provide warning signs, fencing, flagmen, barricades or other safety measures deemed necessary by the Supervisor to protect the public, wildlife, and livestock from hazardous geothermal or related activities.

4. *Recreation.* Recreational values shall be adequately protected through planning and designing of site development to minimize the aesthetic degradation of the particular recreation area. The lessee shall generally be restricted from surface locations for drilling and other lease operations within 61 metres (200 feet) of established recreation sites and access routes thereto. However, the lessee may relocate a recreational site and/or access routes thereto when approved by the Supervisor with the concurrence of the land management agency.

5. *Slope Stability and Erosion Control.* Operations shall be conducted in such a manner so as to minimize erosion and disturbance to natural drainage. The lessee shall provide adequate erosion and drainage control to prevent sediments from disturbed sites from entering water courses for soil and natural resource conservation protection.

Mitigating measures to lessen environmental damage may include reseeding of disturbed soils, chemical stabilization, and dust and erosion control on well sites, roads, and construction areas.

All operating plans shall give proper consideration to the potential hazards of slope instability. Where potentially unstable ground conditions exist, design of proposed roads, drill sites, and surface facilities shall be approved by and constructed under the supervision of a qualified engineer or engineering geologist satisfactory to the Supervisor.

6. *Biota.* The lessee shall conduct all operations in such a manner as to afford reasonable protection of fish, wildlife, and natural habitat. The lessee shall take such measures as are necessary for the conservation of endangered and threatened species of flora and fauna as set forth in applicable executive orders, regulations, and State or Federal legislation such as the Endangered Species Act of 1973 and the Migratory Bird Act of 1966. When such species would be adversely affected by the lessee's operations on the leased lands, the lessee shall implement those measures necessary to minimize or eliminate such adverse effects and to protect the flora and fauna as specified by the Supervisor in accordance with recommendations by appropriate Federal and State agencies. Such measures may be in addition to provisions set forth in the lease or accompanying stipulations.

The Supervisor may receive information from recognized experts that a delicate balance of flora and/or fauna exists in the area of operations or proposed operations. Upon receiving such notice, the Supervisor will request timely advice and assistance from appropriate Federal and State agencies regarding: (1) an assessment of the status of flora and fauna in the area which may be adversely affected by operations, and (2) advice as to reasonable mitigating measures appropriate to minimizing or preventing adverse trends in populations, growth, vegetative recovery, or repopulations in potentially affected flora and/or fauna. Based on timely receipt of advice from appropriate agencies, the Supervisor will direct the lessee to take appropriate measures to minimize significant adverse trends in flora and fauna. Such measures may include, but not be limited to, revegetation with grasses, shrubs, or other vegetation of high forage values desirable for habitat, replacement of fauna where lost, replacement of water supply, or sources where destroyed.

Where the lessee's operations have destroyed significant flora and/or fauna or their natural habitat and replacement by natural processes will not take place in a normal growth cycle, the lessee shall take reasonable measures to replace those species or their habitat with the same or other acceptable species or habitat as directed by the Supervisor. The Supervisor's requirements shall be based on recommendations and advice received from appropriate Federal and State agencies.

7. *Cultural Resources Preservation.* The lessee shall exercise due diligence in the conduct of his operations to protect and preserve significant archaeological, historical, cultural, paleontological, and unique geologic sites. The lessee shall not disturb any known cemetery or burial ground of any group or culture.

Previously unknown sites uncovered by the lessee shall be immediately reported to the Supervisor, and operations on the particular site shall cease until said site can be assessed for its archaeological value and preservation. Necessary controls and remedial actions for the protection and preservation of cultural resources shall be issued on an individual site basis by the Supervisor as warranted.

The preservation, restoration, maintenance, and nomination of all resources for purposes of the National Register of Historic Places shall be in accordance with the provisions of Executive Order 11593 (36 FR 8921) entitled, "Protection and Enhancement of the Cultural Environment," or any amendments thereto.

8. *Subsidence and Seismicity.* Surveying of the land surface prior to and during geothermal resources production will be required for determining any changes in elevation of the leased lands. Lessees shall make such resurveys as required by the Supervisor to ascertain if subsidence is occurring. Production data, pressures, reinjection rates, and volumes shall be accurately recorded and filed monthly with the Supervisor as provided in 30 CFR 270.37. In the event subsidence activity results from the production of geotherm resources, as determined by surveys by the lessee or a governmental body, the lessee shall take such mitigating actions as are required by the lease terms and by the Supervisor.

If subsidence is determined by the Supervisor to present a significant hazard to operations or adjoining land use, then the Supervisor may require remedial action including, but not limited to, reduced production rates, increased injection of waste or other fluids, or a suspension of production.

A. *Surveys.* All required surveys shall be second order or better and shall be conducted under the direct supervision of a registered civil engineer or licensed land surveyor using equipment acceptable by the National Ocean Survey for second order surveys. All such work shall be coordinated with the county surveyor of the county in which the surveys and bench marks are to be established. Level lines and networks shall be tied to available regional networks.

Adjusted survey data shall be filed with the Supervisor within 60 days after leveling is completed. Any lessee having a commercially productive geothermal well or wells shall participate in cooperative County/State subsidence detection programs. All survey data filed with the Supervisor shall be available to the public.

B. *Bench Marks.* One or more wellsite bench marks shall be required at each completed well prior to prolonged production and said bench marks shall be located in a manner such that there is a minimal probability of destruction or damage to said bench marks. Wellsite bench marks shall be tied to existing regional networks. Additional bench marks between the wellsites and the regional network shall be at 0.8-km (one-half mile) intervals or as otherwise specified by the Supervisor. These bench marks shall be resurveyed during well production operations on a periodic basis as determined by the Supervisor.

Acceptable bench marks include, but are not limited to, a brass rod driven to refusal or 9 metres (about 30 feet) and fitted with an acceptable brass plate or a permanent structure with an installed acceptable brass plate.

C. *Reservoir Data.* Initial reservoir pressure and temperature shall be reported to the Supervisor in duplicate on Well Completion or Recompletion Report (Form 9–330C) for all completed wells within 30 days after the completion of measurements or tests conducted for the purpose of obtaining such data. Initial production test data including steam/water ratio, surface pressure and temperature, quality, and quantity of well effluent shall also be filed with the Supervisor on Form 9–330C within 30 days after a well is completed.

D. *Seismicity.* The installation of seismographs or other like instruments in producing geothermal areas for the purpose of detecting potential seismic activity may be initiated from time to time by appropriate public agencies. Lessees shall cooperate with the appropriate public agencies in this regard. The lessee and the appropriate public agency should take care not to unreasonably interfere with or endanger each other's respective operations. The Supervisor shall coordinate such detection programs between the appropriate public agency conducting the program and the lessee.

Where induced seismicity caused by the production of geothermal fluids is determined to exist by the Supervisor, then the Supervisor may require the lessee to install such monitoring devices as necessary to adequately quantify the effects thereof. If induced seismicity is determined to represent a significant hazard, the Supervisor may require remedial actions including, but not limited to, reduced production rates, increased injection of waste or other fluids, or suspension of production.

9. *Pollution, Waste Disposal, and Fire Prevention.* The lessee shall comply with all applicable Federal and State standards with respect to the control of all forms of air, land, water, and noise pollution, including the control of erosion and the disposal of liquid, solid, and gaseous wastes. The Supervisor may, at his discretion, establish additional and more stringent standards. Plans for disposal of well effluents must be approved by the Supervisor before any implementation action is undertaken. Immediate corrective action shall be taken in all cases where pollution has occurred.

The lessee shall timely remove or dispose of all waste including human waste, trash, refuse, and extraction and processing waste generated in connection with the lessee's operations in a manner acceptable to the Supervisor.

The lessee shall provide safeguards to minimize potential accidental fires and shall instruct field personnel in fire-prevention methods. The lessee shall maintain firefighting equipment in working order at strategic locations on the leased lands.

A. *Pollution Prevention.* In the conduct of all geothermal operations, the lessee shall not contaminate any natural waters and shall minimize adverse effects on the environment.

(1) *Liquid Disposal.* Liquid well effluent or the liquid residue thereof containing substances, including heat, which may be harmful or injurious and cannot otherwise be disposed of in conformance with Federal, State, and regional standards, shall be injected into the geothermal resources zone or such other formation as is approved by the Supervisor.

Toxic drilling fluids shall be disposed of in a manner approved by the Supervisor and in conformance with applicable Federal, State, and regional standards.

(2) *Solid Waste Disposal.* Drill cuttings, sand, precipitates, and other solids shall be disposed of as directed by the Supervisor either on location or at other approved disposal sites. Containers for mud additives for chemicals and other solid waste materials shall be disposed of in a manner and place approved by the Supervisor.

(3) *Air Quality.* Noncondensible gases such as carbon dioxide, ammonia, and hydrogen sulfide may be vented or ejected into the atmosphere, provided, however, that the volume and the measured concentration of such vented gas or gases shall not exceed applicable Federal, State, or regional air pollution standards. Copies of each permit issued by the appropriate air pollution control agency and the reports required thereunder shall be submitted to the Supervisor.

(4) *Pits and Sumps.* Pits and sumps shall be lined with impervious material and purged of environmentally harmful chemicals and precipitates before backfilling. In no event shall the contents of a pit or sump be allowed to contaminate streams, lakes, and ground waters. Pits and sumps shall be constructed in a manner and in such locations so as to minimize damage to the natural environment and aesthetic values of the lease or adjacent property. When no longer used or useful, pits and sumps shall be backfilled and the premises restored to as near a natural state as reasonably possible. Temporary fencing of unattended pits and sumps to protect wildlife, livestock, and the public may be required by the Supervisor and the surface management agency.

(5) *Production Facilities Maintenance.* Production facilities shall be operated and maintained at all times in a manner necessary to prevent pollution. The lessee's field personnel shall be instructed in the proper maintenance and operations of production facilities for the prevention of pollution.

B. *Inspection and Reports.* Lessees shall comply with the following pollution inspection and reporting requirements.

(1) *Pollution Inspections.* Drilling and production facilities shall be inspected daily by the lessee. Appropriate preventative maintenance shall be performed as necessary to prevent failures and malfunctions which could lead to pollution. Wells and areas not under production shall be inspected by the lessee at intervals prescribed by the Supervisor. Necessary repairs or maintenance shall be made as required.

(2) *Pollution Reports.* All pollution incidents shall be reported orally within 18 hours to the appropriate Geothermal District Supervisor and shall be followed within 30 days thereof by a written report stating the cause and corrective action taken.

C. *Injection.* The use of any subsurface formation, including the geothermal resources zone for the disposal of well effluent, the residue thereof, or the injection of fluids for other purposes such as subsidence prevention shall not be permitted until the lessee has submitted a plan of injection covering the proposed injection project and has subsequently received the Supervisor's written approval thereof.

(1) *Plan of Injection.* The plan of injection shall include the quantity, quality, and source of the proposed injection fluid; the means and method by which the fluid is to be injected; a structure map contoured on the intended injection zone; and cross-sections showing producing well locations and the proposed injection well location(s).

(2) *Injection Report.* The lessee shall file in duplicate with the Supervisor a Monthly Water Injection Report in a form approved by the Supervisor. The subject report shall be filed on or before the last day of the month following the month in which the injection took place.

(3) *Inspection.* Injection wells and facilities shall be inspected by the lessee at intervals as prescribed by the Supervisor to ascertain that all injected fluids are confined to the approved injection zone. A spinner survey, a radioactive tracer survey, and a cement bond log may be required on each injection well within 30 days after injection begins. The lessee shall furnish to the Supervisor two legible exact copies of any and all such surveys and logs. In the event of a casing failure, inadequate annular cement, or other mechanical failure, the lessee shall without unreasonable delay repair, suspend, or abandon the well. Where failure occurs in a zone which may damage surface or fresh water aquifers, injection shall immediately cease.

(4) *New Wells.* The drilling of new injection wells in accordance with an approved plan of injection shall be in conformance with the provisions of GRO Order No. 2. An Application for Permit to Drill, Form 9–331C, shall be filed in triplicate and approved for each injection well.

(5) *Conversions.* The conversion of an existing well to an injection well in accordance with or modification of an approved plan of injection shall be in conformance with the requirements of GRO Order No. 2. The lessee shall demonstrate to the satisfaction of the Supervisor by appropriate testing and logging that the well is mechanically sound and suitable for injection purposes. A Sundry Notice, Form 9–331, shall be filed in triplicate and approved for each conversion.

10. *Water Quality.* The primary responsibility for water quality and pollution control has been delegated to the States where such States have standards approved by the Environmental Protection Agency. Such State standards must meet basic Federal requirements prohibiting the deterioration of waters whose existing quality is higher than established water quality standards. The lessee shall comply with the State water quality control organization's standards in such States as have federally-approved standards. The Supervisor, at his discretion, may establish additional and more stringent standards.

The lessee shall file, in duplicate, a detailed water analysis report for all completed geothermal wells within 30 days after completion and annually thereafter or as otherwise specified by the Supervisor. Unless otherwise prescribed by the Supervisor, such analyses shall include a determination of arsenic, boron, radioactive content, and radioactivity of the produced fluids. In the event that a health hazard exists, the Supervisor shall require appropriate health and safety precautions, periodic monitoring, or the suspension of production.

11. *Noise Abatement.* The lessee shall minimize noise during exploration, development, and production activities. The method and degree of noise abatement shall be as approved by the Supervisor.

The lessee shall conduct noise level measurements during exploration, development, and production operations to determine the potential objectionability to nearby residents as well as the potential health and safety danger due to noise emissions.

Noise level measurements and accompanying data shall be filed with the Supervisor. Such data shall provide the basis for operational and noise control decisions by the Supervisor and shall be based on an assessment of the noise relative to Federal or State criteria including adjustments for the area involved, meteorological conditions, and the time of day of the noise occurrence.

The lessee shall comply with Federal occupational noise exposure levels applicable to geothermal activity under the Occupational Safety and Health Act of 1970 as set forth in 29 CFR 1910.95, which are incorporated herein by reference, or with State standards for protection of personnel where such State standards are more restrictive than Federal standards.

A. *Measurement Condition.* Outdoor noise measurements shall be made at least 3 metres (10 feet) from structures, facilities, or other sound reflecting sources and approximately 1 metre (3 feet) above ground level. Extreme weather conditions, electrical interference, and unusual background noise levels shall be avoided or given due consideration when measuring sound levels.

B. *Measurements.* The lessee shall monitor and measure noise levels using an octave band noise analyzer with an A-weighted frequency response or a standard sound level meter that conforms to the requirements set forth in USA Standard Specifications for General Purpose Sound Level Meters USASI S1.4–1961 or the latest approved revision thereof. Bandpass filters shall conform to the requirements of USASI S1.11–1966. The lessee shall measure noise level frequency distribution as required by the Supervisor. Sound levels shall be measured in conformance with the USA Standard-Method for the Physical Measurement of Sound USASI S1.2–1962.

C. *Criteria.* In the absence of more restrictive criteria as may be established in this paragraph, the lessee shall not exceed a noise level of 65 dB(A) for all geothermal-related activity including but not limited to, exploration, development, or production operations as measured at the lease boundary line or 0.8 km (one-half mile) from the source, whichever is greater, using the A-weighted network of a standard Sound Level Meter. However, the permissible noise level of 65 dB(A) may be exceeded under emergency conditions or with the Supervisor's approval if written permission is first obtained by the lessee from all residents within 0.8 km (one-half mile).

D. *Assessment.* The lessee shall be responsible for taking such noise level measurements as are deemed necessary by the Supervisor. The background noise level shall serve as the criterion for the rating and assessment, by the Supervisor, of the objectionableness of noise emission from a particular source. The background or ambient noise is defined hereby as the minimum sound level at the relevant place and time in the absence of the source noise and shall include consideration for the type of land use, the season, atmospheric conditions, and the time of day.

E. *Attenuation.* To attenuate objectionable noise, the lessee shall utilize properly designed muffling devices as required by the Supervisor.

F. *Relationships.* Reference levels and relationships for noise measurements shall be as follows:

(1) Reference sound pressure for airborne sounds shall be 20 MN/m (20 micronewtons per square metre).

(2) Reference power shall be 10–12 watts.

(3) Sound levels shall be measured using a standard Sound Level Meter with an "A" frequency response characteristic (weighting network).

(4) Sound level meter controls shall be set for as uniform a frequency response as possible when measuring sound pressure levels.

(5) Octave band noise levels shall be reported in equivalent A-weighted levels.

G. *Record of Sound Measurements.* The Supervisor may require sound level measurements during drilling, testing, and producing operations. Such measurements shall be filed in duplicate with the Supervisor and shall include the following data:

(1) Date, time, and location.

(2) Name of observer.

(3) Description of primary noise source emitter under test.

(4) Kind of operation and operating conditions.

(5) Description of secondary noise sources including location, type, and kind of operation.

(6) Type and serial numbers on all microphones, sound level meters, and octave band analyzers used. Length and type of microphone cables.

(7) Position of observer.

(8) Direction of arrival of sound with respect to microphone orientation.

(9) Approximate temperature of microphone.

(10) Results of maintenance and calibration tests.

(11) Weighting network and meter speed used.

(12) Measured overall response and band levels at each microphone position and extent of meter fluctuation.

(13) Background overall response and band levels at each microphone position with primary noise source not operating.

(14) Cable and microphone corrections.

(15) Any other pertinent data such as personnel exposed directly and indirectly, time pattern of the exposure, atmospheric conditions, attempts at noise control and personnel protection.

REID T. STONE,
Area Geothermal Supervisor.

APPROVED: RUSSELL G. WAYLAND,
Chief, Conservation Division.

[FR Doc.75-21476 Filed 8-14-75;8:45 am]

National Park Service

HISTORIC AMERICAN BUILDINGS SURVEY ADVISORY BOARD

Meeting

Notice is hereby given in accordance with the Federal Advisory Committee Act that a meeting of the Historic American Buildings Survey (HABS) Advisory Board will be held on September 12 and 13, starting at 9:15 a.m., in the Conference Room of the Herbert F. Johnson Museum of Art, at Cornel University, Ithaca, New York.

The HABS Advisory Board was established by the Secretary of the Interior on November 17, 1933, and sanctioned by an Act of Congress, August 21, 1935, to render advice on matters related to the task of preserving records of the historic architectural monuments of the United States.

The present membership of the HABS Advisory Board is as follows:

Mr. D. O. Davies, New Castle, Pennsylvania.
Dr. John Douglas Forbes, Charlottesville, Virginia.
Dr. Richard W. Hale, Jr., Boston, Massachusetts, Secretary.
Mr. John D. Henderson, AIA, San Diego, California, Vice-Chairman.
Mrs. Victorine Du Pont Homsey, FAIA, Wilmington, Delaware.
Dr. Barclay G. Jones, AIA, AIP, Ithaca, New York.
Mr. George McMath, AIA, Portland, Oregon.
Prof. F. Blair Reeves, AIA, Gainesville, Florida, Chairman.
Miss Barbara Wriston, Chicago, Illinois.
Mr. Thomas B. Muths, Jackson, Wyoming, ex officio member, from the American Institute of Architects.
The Librarian of Congress, ex officio member (represented by Dr. Alan Fern, Chief, Div. of Prints and Photographs), Washington, D.C.

Among other things, the Advisory Board agenda will consist of reports from the Chief of the Historic American Buildings Survey and staff reports on summer measured drawing projects and HABS publications. There will also be a viewing of three significant exhibitions related to HABS work. In the Olin Library, an exhibit will be based on Cornell's rare book collection, and developed from "Architectural Measured Drawings: Their Evolution, Use, and Influence on the Study of Architectural History," a Ph.D. thesis by John Poppeliers, HABS Chief. Two other exhibits will be in the Museum of Art: "Terminal, Station, and Depot," a historic development and adaptive-use photographic exhibition developed by HABS, and a retrospective show of the work of Jack E. Boucher, historic architectural protographer for the Office of Archeology and Historic Preservation.

The meeting is open to the public, and any person may file with the Board a written statement concerning the matters being discussed; however, facilities and space for accommodating members of the public are limited.

Further information concerning these meetings may be obtained from the Office of Archeology and Historic Preservation, National Park Service, Washington, D.C. (202) 523-5295. Minutes of the meeting may be acquired through the Executive Secretary of the Board, Mrs. Lucy Pope Wheeler, HABS (202) 523-5474, after the succeeding meeting of the Advisory Board.

A. R. MORTENSEN,
Director, Office of Archeology and Historic Preservation.

[FR Doc.75-21534 Filed 8-14-75;8:45 am]

Bureau of Reclamation

GENERAL ADJUSTMENTS IN POWER RATES

Final Procedures for Public Participation in General Adjustments in Power Rates

On May 21, 1975, the Bureau of Reclamation published in the FEDERAL REGISTER a draft of "Proposed Procedures for Public Participation in General Adjustments in Power Rates," 40 FR 22156. On June 16, 1975, a short notice was published that corrected the omission of the name of the Bureau from the title and extended the time for public comment to July 7, 1975.

Fifteen communications were received in response to these notices.

A detailed review of these comments were made, and copies of the comments and of that review are available for public inspection at the office listed below.

Chief, Division of Power, Bureau of Reclamation, Room 7612, Department of the Interior, Washington, D.C. 20240, Telephone: (202) 343-5337.

Based on the review, the final procedures have been adopted and appear below. The principal changes made from the proposed procedures as a result of the review include clarification of the fact that the procedures apply only to the Bureau of Reclamation, that copies of the tentative proposal will be mailed to all customers, and that copies of the entire record developed during the proceeding will be available on request for a fee. The public information meeting has been changed to a "public information forum," and the formal public hearing has been changed to a "public comment forum." Both forums will be conducted by a chairman who will be responsible for orderly procedures. The Department has rejected the recommendations that rates be set through an adjudicatory proceeding involving sworn testimony, cross-examination, and an initial decision by the administrative law judge as inappropriate since it would divorce ratesetting from responsibility for administering reclamation projects.

JACK O. HORTON,
Assistant Secretary of the Interior.

AUGUST 4, 1975.

PROCEDURES FOR PUBLIC PARTICIPATION IN GENERAL ADJUSTMENTS IN POWER RATES

1. *Purpose and scope.* The purpose of these procedures is to afford interested members of the public a reasonable opportunity for meaningful participation in the development of general adjustments in power rates of the Bureau of Reclamation. It applies to general adjustments in the power rates for a project that are necessary to assure financial feasibility, but it does not apply to other rate actions that have a minor impact on financial feasibility, such as technical adjustments in rates, the adoption of special rates for limited purposes, the adoption of rates for use in connection with power pool operations, and the like.

2. *Statutory authority.* The establishment of power rates by the Bureau of Reclamation for Federal Reclamation projects is pursuant to the Reclamation Act of 1902, as amended and supplemented by subsequent enactments, particularly section 9(c) of the Reclamation Project Act of 1939, 43 U.S.C. 485h(c), and the acts specifically applicable to the project in question. Consideration also is given to the statutes under which other Interior power marketing agencies operate, particularly section 5 of the Flood Control Act of 1944, 16 U.S.C. 825s, and the Bonneville Project Act, as amended, 16 U.S.C. 832 et seq.

3. *Definitions.* As used herein—

a. "Departmental" refers to all personnel and components of the Department of the Interior, including, but not limited to, the Office of the Secretary, the Office of the Solicitor, and the Bureau of Reclamation.

b. "Secretary" includes the following officers of the Department of the Interior: Secretary, Acting Secretary, Under Secretary, Acting Under Secretary, Deputy Under Secretary, Assistant Secretary, Acting Assistant Secretary, and Deputy Assistant Secretary.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Notice Number

NOTICE OF INTENT TO CONDUCT GEOTHERMAL RESOURCE EXPLORATION OPERATIONS

Applicant(s)	Address *(include zip code)*
Operator	Address *(include zip code)*
Contractor(s)	Address *(include zip code)*

hereby apply for authorization to conduct exploration operations pursuant to the provisions of 43 CFR 3209 now or hereafter in force across and upon the following-described lands *(give description of lands by township, attach map or maps showing lands to be entered or affected)*

Type of operations to be conducted *(give brief description)*

Exploration operations will be conducted during the period *(date)* from to

Attached ☐ $ Surety bond ☐ Rider to Nationwide bond ☐ Rider to Statewide bond ☐ Bond to be furnished

Upon completion of exploration operations the undersigned agrees to notify the Authorized Officer that authorized exploration operations have been completed in conformance with the general and special terms and stipulations of the notice.

The undersigned hereby agrees (1) that he will not enter upon the described land until he has been informed in writing whether there are special stipulations applicable to his Notice of Intent, as to either time or method of operation or otherwise, and, if there are such stipulations, what those stipulations are, (2) that he will comply with those special stipulations, if any; and (3) that he will not enter upon the described lands until his entry has been approved by the Authorized Officer.

The undersigned agrees to be bound by the terms and conditions of this notice to conduct exploration operations when approved by the Authorized Officer.

The undersigned agrees that the filing of this *Notice* under the regulations (43 CFR Subpart 3209) does not vest or confer any preference right to a geothermal resources lease.

The undersigned agrees further that all exploration operations shall be conducted pursuant to the following terms and conditions:

1. Exploration operations shall be conducted in compliance with all Federal, State, and local laws, ordinances, or regulations which are applicable to the area of operations including, but not limited to, those pertaining to fire, sanitation, conservation, water pollution, fish, and game. All operations hereunder shall be conducted in a prudent manner.

2. Due care shall be exercised in protecting the described lands from damage. All necessary precautions shall be taken to avoid any damage other than normal wear and tear to improvements on the land including, but not limited to, gates, bridges, roads, culverts, cattle guards, fences, dams, dikes, vegetative cover, improvements, stock watering, and other facilities.

3. All drill holes shall be capped when not in use and appropriate procedures shall be taken to protect against hazards in order to protect the lives, safety, or property of other persons or of wildlife and livestock.

4. All vehicles shall be operated at a reasonable rate of speed and, in the operation of vehicles, due care shall be taken to safeguard livestock and wildlife in the vicinity of operations. Existing roads and trails shall be used wherever possible. If new roads and trails are to be constructed, the Authorized Officer must be consulted prior to construction as to location and specifications. Reclamation and/or reseeding of new roads and trails shall be made as requested by the Authorized Officer.

5. Upon expiration, conclusion, or abandonment of operations conducted pursuant to this *Notice*, all equipment shall be removed from the land, and the land shall be restored as nearly as practicable to its original condition by such measures as the Authorized Officer may specify. All geophysical holes shall be safely plugged. The Authorized Officer shall be furnished a *Notice of Completion of Geothermal Resource Exploration Operations* (Form 3200–3) immediately upon cessation of all such operations and shall be further informed of the completion of reclamation work as soon as possible.

6. Location and depth of water sands encountered shall be disclosed to the Authorized Officer.

(Continued on reverse)

7. Operator shall contact the Authorized Officer prior to actual entry upon the land in order to be appraised of practices which shall be followed or avoided in the conduct of exploration operations pursuant to the terms of this *Notice* and applicable regulations. Operator will conduct no operations on the land unless the attached bond is in good standing.

8. Due care shall be exercised to avoid scarring or removal of ground vegetative cover.

9. All operations shall be conducted in such a manner to avoid (a) blockage of any drainage systems; (b) changing the character, or causing the pollution or siltation of rivers, streams, lakes, ponds, waterholes, seeps, and marshes; and (c) damaging fish and wildlife resources or habitat. Cuts or fills causing any of the above-mentioned problems will be repaired immediately in accordance with specifications of the Authorized Officer.

10. Vegetation shall not be disturbed within 300 feet of waters designated by the Authorized Officer, except at approved stream crossings.

11. Surface damage which induces soil movement and/or water pollution shall be subject to corrective action as required by the Authorized Officer.

12. Trails and campsites shall be kept clean. All garbage and foreign debris shall be eliminated as required by the Authorized Officer.

13. Operator shall protect all survey monuments, witness corners, reference monuments, and bearing trees against destruction, obliteration, or damage. He shall, at his expense reestablish damaged, destroyed, or obliterated monuments and corners, using a licensed surveyor, in accordance with Federal survey procedures. A record of the reestablishment shall be submitted to the Authorized Officer.

14. Operator shall make every reasonable effort to prevent, control, or suppress any fires started by the operator, and to report, as soon as possible, to the Authorized Officer location and size of fires, and assistance needed to suppress such fires. Operator shall inform the Authorized Officer as soon as possible of all fires, regardless of location, noted, or suppressed by independent action.

15. No work shall be done within one-half mile of a developed recreation site without specific written authority from the Authorized Officer. Any travel within one-half mile of a recreation site shall be over existing roads or trails.

16. Use of explosives within one-half mile of designated waters is prohibited unless approved, in writing, by the Authorized Officer.

17. If operations conducted under the provisions of this *Notice* causes any damage to the surface of the national resource lands, such as, but not limited to, soil erosion, pollution of water, injury or destruction of livestock or wildlife, or littering, operator shall, within 48 hours, file with the Authorized Officer a map showing exact location of such damage and a written report containing operator's plans for correcting or minimizing damage, if possible.

18. Violation of, or failure to comply with any of these terms and conditions shall result in immediate shutdown of field operations until deficiency is corrected. Failure to correct deficiency within the time period allowed by the Authorized Officer shall result in forfeiture of bond.

19. The Bureau of Land Management reserves the right to close any area to operators in periods of fire danger or when irreparable damage to natural resources is imminent.

20. Contractor shall be liable for assuring compliance with all terms and conditions of this *Notice* and all actions of his designated operator, agents, and employees.

21. Where continuation of the operation will result in irreparable damage to the land and other natural resources this *Notice* will be immediately cancelled by the Authorized Officer.

22. Special Stipulations:

(Signature of Applicant)	(Date)	(Signature of Operator)	(Date)

We hereby agree to the special stipulations added and made a part of this *Notice* to conduct exploration operations.

(Signature of Holder of Notice)	(Date)	(Signature of Operator)	(Date)

I hereby approve this *Notice* to conduct exploration operations.

(Signature of Authorized Officer)	(Title)	(Date)

GPO 851-317

Form 3200–21
(May 1974)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Serial Number

USGS – KGRA Determination:

GEOTHERMAL RESOURCES LEASE

☐ Competitive ☐ Noncompetitive

In consideration of the terms and conditions contained herein, and the grant made hereby, this lease is entered into by the UNITED STATES OF AMERICA (hereinafter called the "Lessor"), acting through the Bureau of Land Management (hereinafter called the "Bureau") of the Department of the Interior (hereinafter called the "Department"), and

(hereinafter called the "Lessee").

This lease is made pursuant to the Geothermal Steam Act of 1970 (84 Stat. 1566; 30 U.S.C. 1001–1025) (hereinafter called "the Act") to be effective on (hereinafter called the "effective date"). It is subject to all the provisions of the Act and to all the terms, conditions, and requirements of (a) all regulations promulgated by the Secretary of the Interior (hereinafter called "the Secretary") in existence upon the effective date, specifically including, but not limited to, 43 CFR Parts 3000 and 3200 and 30 CFR Parts 270 and 271, (b) all geothermal resources operational orders (hereinafter called "GRO orders") issued pursuant thereto, all of which are incorporated herein and by reference made a part hereof, and (c) any regulations hereafter issued by the Secretary (except those inconsistent with any specific provisions of this lease other than regulations incorporated herein by reference) all of which shall be, upon their effective date, incorporated herein and, by reference, made a part hereof.

Sec. 1. GRANT – The Lessor hereby grants and leases to the Lessee the exclusive right and privilege to drill for, extract, produce, remove, utilize, sell, and dispose of geothermal steam and associated geothermal resources, (hereinafter called "geothermal resources"), in or under the following described lands situated within the County of , State of :

National Resource Lands	Acquired Lands
T. ; R. ; Meridian	T. ; R. ; Meridian
Total Area	Total Area

Containing acres (hereinafter called the "leased area" or "leased lands"), together with:

(a) The nonexclusive right to conduct within the leased area geological and geophysical exploration in accordance with applicable regulations; and

(b) The right to construct or erect and to use, operate, and maintain within the leased area, together with ingress and egress thereupon all wells, pumps, pipes, pipelines, buildings, plants, sumps, brine pits, reservoirs, tanks, waterworks, pumping stations, roads, electric power generating plants, transmission lines, industrial facilities, electric, telegraph or telephone lines, and such other works and structures and to use so much of the surface of the land as may be necessary or reasonably convenient for the production, utilization, and processing of geothermal resources or to the full enjoyment of the rights granted by this lease, subject to compliance with applicable laws and regulations; *Provided that*, although the use of the leased area for an electric power generating plant or transmission facilities or a commercial or industrial facility is authorized hereunder, the location of such facilities and the terms of occupancy therefor shall be under separate instruments issued under any applicable laws and regulations; and

(c) The nonexclusive right to drill potable water wells in accordance with state water laws within the leased area and to use the water produced therefrom for operations on the leased lands free of cost, provided that such drilling and development are conducted in accordance with procedures approved by the Supervisor of the Geological Survey (hereinafter called "Supervisor"); and

(d) The right to convert this lease to a mineral lease under the Mineral Leasing Act of February 25, 1920, as amended, and supplemented (30 U.S.C. 181–287) or under the Mineral Leasing Act for Acquired Lands (30 U.S.C. 351–359), whichever is appropriate, if the leasehold is primarily valuable for the production of one or more valuable by-products which are leasable under those statutes, and the lease is incapable of commercial production or utilization of geothermal steam: *Provided that*, an application is made therefor prior to the expiration of the lease extension by reason of by-product production as hereinafter provided, and subject to all the terms and conditions of said appropriate Acts. The Lessee is also granted the right to locate mineral deposits under the mining laws (30 U.S.C. 21–54), which would constitute by-products if commercial production or utilization of geothermal steam continued, but such a location to be valid must be completed within ninety (90) days after the termination of this lease. Any conversion of this lease to a mineral lease or a mining claim is contingent on the availability of such lands for this purpose at the time of the conversion. If the lands are withdrawn or acquired in aid of a function of any Federal Department or agency, the mineral lease or mining claim shall be subject to such additional terms and conditions as may be prescribed by such Department or agency for the purpose of making operations thereon consistent with the purposes for which these lands are administered; and

(e) The right, without the payment of royalties hereunder, to reinject into the leased lands geothermal resources and condensates to the extent that such resources and condensates are not utilized, but their reinjection is necessary for operations under this lease in the recovering or processing of geothermal resources. If the Lessee, pursuant to any approved plan, disposes of the unusable brine and produced waste products into underlying formations, he may do so without the payment of royalties.

Sec. 2. TERM

(a) This lease shall be for a primary term of ten (10) years from the effective date and so long thereafter as geothermal steam is produced or utilized in commercial quantities but shall in no event continue for more than forty (40) years after the end of the primary term. However, if at the end of that forty-year period geothermal steam is being produced or utilized in commercial quantities, and the leased lands are not needed for other purposes, the Lessee shall have a preferential right to a renewal of this lease for a second forty-year term in accordance with such terms and conditions as the Lessor deems appropriate.

(b) If actual drilling operations are commenced on the leased lands or under an approved plan or agreement on behalf of the leased lands prior to the end of the primary term, and are being diligently prosecuted at the end of the primary term, this lease shall be extended for five (5) years and so long thereafter, but not more than thirty-five (35) years, as geothermal steam is produced or utilized in commercial quantities. If at the end of such extended term geothermal steam is being produced or utilized in commercial quantities, the Lessee shall have a preferential right to a renewal for a second term as in (a) above.

(c) If the Lessor determines at any time after the primary term that this lease is incapable of commercial production and utilization of geothermal steam, but one or more valuable by-products are or can be produced in commercial quantities, this lease shall be extended for so long as such by-products are produced in commercial quantities but not for more than five (5) years from the date of such determination.

Sec. 3. RENTALS AND ROYALTIES

(a) *Annual Rental* – For each lease year prior to the commencement of production of geothermal resources in commercial quantities on the leased lands, the Lessee shall pay the Lessor on or before the anniversary date of the lease a rental of $ for each acre or fraction thereof.

(b) *Escalating Rental* – Beginning with the sixth lease year and for each year thereafter until the lease year beginning on or after the commencement of production of geothermal resources in commercial quantities, the Lessee shall pay on or before the anniversary date of the lease an escalated rental in an amount per acre or fraction thereof equal to the rental per acre for the preceding year and an additional sum of one (1) dollar per acre or fraction thereof. If the lease is extended beyond ten (10) years for reasons other than the commencement of production of geothermal resources in commercial quantities, the rental for the eleventh year and for each lease year thereafter until the lease year beginning on or after the commencement of such production will be the amount of rental for the tenth lease year. If any expenditures are made in any lease year for diligent exploration on the leased lands in excess of the minimum required expenditures for that year, the excess may be credited against any rentals in excess of $ per acre or fraction thereof due the Lessor for that or any future year.

(c) *Royalty* – On or before the last day of the calendar month after the month of commencement of production in commercial quantities of geothermal resources and thereafter on a monthly basis, the Lessee shall pay to the Lessor:

(1) A royalty of percent on the amount or value of steam, or any other form of heat or other associated energy produced, processed, removed, sold, or utilized from this lease or reasonably susceptible to sale or utilization by the Lessee.

(2) A royalty of percent of the value of any by-product derived from production under this lease, produced, processed, removed, sold, or utilized from this lease or reasonably susceptible of sale or utilization by the Lessee, except that as to any by-product which is a mineral named in Sec. 1 of the Mineral Leasing Act of February 25, 1920, as amended, (30 U.S.C. 181), the rate of royalty for such mineral shall be the same as that provided in that statute and the maximum rate of royalty for such mineral shall not exceed the maximum royalty applicable under that statute.

(3) A royalty of percent of the value of commercially demineralized water which has been produced from the leased lands, and has been sold or utilized by the Lessee or is reasonably susceptible of sale or utilization by the Lessee. In no event shall the Lessee pay to the Lessor, for the lease year beginning on or after the commencement of production in commercial quantities on the leased lands or any subsequent lease year, a royalty of less than two (2) dollars per acre or fraction thereof. If royalty paid on production during the lease year has not satisfied this requirement, the Lessee shall pay the difference on or before the expiration date of the lease year for which it is paid.

(d) *Waiver and Suspension of Rental and Royalties* – Rentals or royalties may be waived, suspended, or reduced pursuant to the applicable regulations on the entire leasehold or any portion thereof in the interest of conservation or for the purpose of encouraging the greatest ultimate recovery of geothermal resources if the Lessor determines that it is necessary to do so to promote such development, or because the lease cannot be successfully operated under the terms fixed herein.

(e) *Undivided Fractional Interests* – Where the interest of the Lessor in the geothermal resources underlying any tract or tracts described in Sec. 1 is an undivided fractional interest, the rentals and royalties payable on account of each such tract shall be in the same proportion to the rentals and royalties provided in this lease as the individual fractional interest of the Lessor in the geothermal resources underlying such tract is to the full fee interest.

(f) *Readjustments* – Rentals and royalties hereunder may be readjusted in accordance with the Act and regulations to rates not in excess of the rates provided therein, and at not less than twenty (20) year intervals beginning thirty-five (35) years after the date geothermal steam is produced from the lease as determined by the Supervisor.

Sec. 4. PAYMENTS – It is expressly understood that the Secretary may establish the values and minimum values of geothermal resources to compute royalties in accordance with the applicable regulations. Unless otherwise directed by the Secretary, all payments to the Lessor will be made as required by the regulations. If there is no well on the leased lands capable of producing geothermal resources in commercial quantities, the failure to pay rental on or before the anniversary date shall cause the lease to terminate by operation of law except as provided by Sec. 3244.2 of the regulations. If the time for payment falls on a day on which the proper office to receive payment is closed, payment shall be deemed to be made on time if made on the next official working day.

Sec. 5. BONDS – The Lessee shall file with the Authorized Officer of the Bureau (hereinafter called the "Authorized Officer") shall maintain at all times the bonds required under the regulations to be furnished as a condition to the issuance of this lease or prior to entry on the leased lands in the amounts established by the Lessor and to furnish such additional bonds or security as may be required by the Lessor upon entry on the lands or after operations or production have begun.

Sec. 6. WELLS

(a) The Lessee shall drill and produce all wells necessary to protect the leased land from drainage by operations on lands not the property of the Lessor, or other lands of the Lessor leased at a lower royalty rate, or on lands as to which royalties and rentals are paid into different funds from those into which royalties under this lease are paid. However, in lieu of any part of such drilling and production, with the consent of the Supervisor, the Lessee may compensate the Lessor in full each month for the estimated loss of royalty through drainage in the amount determined by said Supervisor.

(b) At the Lessee's election, and with the approval of the Supervisor, the Lessee shall drill and produce other wells in conformity with any system of well spacing or production allotments affecting the field or area in which the leased lands are situated, which is authorized by applicable law.

(c) After due notice in writing, the Lessee shall diligently drill and produce such wells as the Supervisor shall require so that the leased lands may be properly and timely developed and for the production of geothermal steam and its by-products, including commercially demineralized water for beneficial uses in accordance with applicable state laws. However, the Supervisor may waive or modify the requirements of this subparagraph (c) in the interest of conservation of natural resources or for economic feasibility or other reasons satisfactory to him. If the products or by-products of geothermal production from wells drilled on this lease are susceptible of producing commercially demineralized water for beneficial uses, and a program therefor is not initiated with due diligence, the Lessor may at its option elect to take such products or by-products and the Lessee shall deliver all or any portion thereof to the Lessor at any point in the Lessee's geothermal gathering or disposal system without cost to the Lessee, if the Lessee's activities, under the lease, would not be impaired and such delivery would otherwise be consistent with field and operational requirements. The retention of this option by the Lessor shall in no way relieve the Lessee from the duty of producing commercially demineralized water where required to do so by the Lessor, except when the option is being exercised and then only with respect to wells where it is being exercised, or limit the Lessor's right to take any action under Sec. 25 to enforce that requirement.

Sec. 7. INSPECTION – The Lessee shall keep open at all reasonable times for the inspection of any duly authorized representative of the Lessor the leased lands and all wells, improvements, machinery, and fixtures thereon and all production reports, maps, records, books, and accounts relative to operations under the lease, and well logs, surveys, or investigations of the leased lands.

Sec. 8. CONDUCT OF OPERATIONS – The Lessee shall conduct all operations under this lease in a workmanlike manner and in accordance with all applicable statutes, regulations, and GRO orders, and all other appropriate directives of the Lessor to prevent bodily injury, danger to life or health, or property damage, and to avoid the waste of resources, and shall comply with all requirements which are set forth in 43 CFR Group 3200, including, but not limited to, Subpart 3204, or which may be prescribed by the Lessor pursuant to the regulations, and with the special stipulations which are attached to the lease, all of which are specifically incorporated into this lease. A breach of any term of this lease, including the stipulations attached hereto, will be subject to all the provisions of this lease with respect to remedies in case of default. Where any stipulation is inconsistent with a regular provision of this lease, the stipulation shall govern.

Sec. 9. INDEMNIFICATION

(a) The Lessee shall be liable to the Lessor for any damage suffered by the Lessor in any way arising from or connected with the Lessee's activities and operations conducted pursuant to this lease, except where damage is caused by employees of the Lessor acting within the scope of their authority.

(b) The Lessee shall indemnify and hold harmless the Lessor from all claims arising from or connected with the Lessee's activities and operations under this lease.

(c) In any case where liability without fault is imposed on the Lessee pursuant to this section, and the damages involved were caused by the action of a third party, the rules of subrogation shall apply in accordance with the law of the jurisdiction where the damage occurred.

Sec. 10. CONTRACTS FOR SALE OR DISPOSAL OF PRODUCTS – The Lessee shall file with the Supervisor not later than thirty (30) days after the effective date thereof any contract, or evidence of other arrangement for the sale or disposal of geothermal resources.

Sec. 11. ASSIGNMENT OF LEASE OR INTEREST THEREIN – Within ninety (90) days from the date of execution thereof, the Lessee shall file for approval by the Authorized Officer any instruments of transfer made of this lease or of any interest therein, including assignments of record title and working or other interests.

Sec. 12. REPORTS AND OTHER INFORMATION – At such times and in such form as the Lessor may prescribe, the Lessee shall comply with all reporting requirements of the geothermal resources leasing, operating, and unit regulations and shall submit quarterly reports containing the data which it has collected through the monitoring of air, land, and water quality and all other data pertaining to the effect on the environment by operations under the lease. The Lessee shall also comply with such other reporting requirements as may be imposed by the Authorized Officer or the Supervisor. The Lessor may release to the general public any reports, maps, or other information submitted by the Lessee except geologic and geophysical interpretations, maps, or data subject to 30 CFR 270.79 or unless the Lessee shall designate that information as proprietary and the Supervisor or the Authorized Officer shall approve that designation.

Sec. 13. DILIGENT EXPLORATION – In the manner required by the regulations, the Lessee shall diligently explore the leased lands for geothermal resources until there is production in commercial quantities applicable to this lease. After the fifth year of the primary term the Lessee shall make at least

the minimum expenditures required to qualify the operations on the leased lands as diligent exploration under the regulations.

Sec. 14. PROTECTION OF THE ENVIRONMENT (LAND, AIR AND WATER) AND IMPROVEMENTS – The Lessee shall take all mitigating actions required by the Lessor to prevent: (a) soil erosion or damage to crops or other vegetative cover on Federal or non-Federal lands in the vicinity; (b) the pollution of land, air, or water; (c) land subsidence, seismic activity, or noise emissions; (d) damage to aesthetic and recreational values; (e) damage to fish or wildlife or their habitats; (f) damage to or removal of improvements owned by the United States or other parties; or (g) damage to or destruction or loss of fossils, historic or prehistoric ruins, or artifacts. Prior to the termination of bond liability or at any other time when required and to the extent deemed necessary by the Lessor, the Lessee shall reclaim all surface disturbances as required, remove or cover all debris or solid waste, and, so far as possible, repair the effects and onsite damage caused by his activity or activities incidental thereto, and return access roads or trails and the leased lands to an acceptable condition including the removal of structures, if required. The Supervisor or the Authorized Officer shall prescribe the steps to be taken by Lessee to protect the surface and the environment and for the restoration of the leased lands and other lands affected by operations on the leased lands and improvements thereon, whether or not the improvements are owned by the United States. Timber or mineral materials may be obtained only on terms and conditions imposed by the Authorized Officer.

Sec. 15. WASTE – The Lessee shall use all reasonable precautions to prevent waste of natural resources and energy, including geothermal resources, or of any minerals, and to prevent the communication of water or brine zones with any oil, gas, fresh water, or other gas or water bearing formations or zones which would threaten destruction or damage to such deposits. The Lessee shall monitor noise, air, and water quality conditions in accordance with any orders of the Supervisor.

Sec. 16. MEASUREMENTS – The Lessee shall gauge or otherwise measure all production, sales, or utilization of geothermal resources and shall record the same accurately in records as required by the Supervisor. Reports on production, sales, or utilization of geothermal resources shall be submitted in accordance with the terms of this lease and the regulations.

Sec. 17. RESERVATIONS TO LESSOR – All rights in the leased area not granted to the Lessee by this lease are hereby reserved to the Lessor. Without limiting the generality of the foregoing such reserved rights include:

(a) *Disposal* – The right to sell or otherwise dispose of the surface of the leased lands or any resource in the leased lands under existing laws, or laws hereafter enacted, subject to the rights of the Lessee under this lease;

(b) *Rights-of-way* – The right to authorize geological and geophysical explorations on the leased lands which do not interfere with or endanger actual operations under this lease, and the right to grant such easements or rights-of-way for joint or several use upon, through or in the leased area for steam lines and other public or private purposes which do not interfere with or endanger actual operations or facilities constructed under this lease;

(c) *Mineral Rights* – The ownership of and the right to extract oil, hydrocarbon gas, and helium from all geothermal steam and associated geothermal resources produced from the leased lands;

(d) *Casing* – The right to acquire the well and casing at the fair market value of the casing where the Lessee finds only potable water, and such water is not required in lease operations; and

(e) *Measurements* – The right to measure geothermal resources and to sample any production thereof.

Sec. 18. ANTIQUITIES AND OBJECTS OF HISTORIC VALUE – The Lessee shall immediately bring to the attention of the Authorized Officer any antiquities or other objects of historic or scientific interest, including but not limited to historic or prehistoric ruins, fossils, or artifacts discovered as a result of operations under this lease, and shall leave such discoveries intact. Failure to comply with any of the terms and conditions imposed by the Authorized Officer with regard to the preservation of antiquities may constitute a violation of the Antiquities Act (16 U.S.C. 431-433). Prior to operations, the Lessee shall furnish to the Authorized Officer a certified statement that either no archaeological values exist or that they may exist on the leased lands to the best of the of the Lessee's knowledge and belief and that they might be impaired by geothermal operations. If the Lessee furnishes a statement that archaeological values may exist where the land is to be disturbed or occupied, the Lessee will engage a qualified archaeologist, acceptable to the Authorized Officer, to survey and salvage, in advance of any operations, such archeeological values on the lands involved. The responsibility for the cost for the certificate, survey, and salvage will be borne by the Lessee, and such salvaged property shall remain the property of the Lessor or the surface owner.

Sec. 19. DIRECTIONAL DRILLING – A directional well drilled under the leased area from a surface location on nearby land not covered by the lease shall be deemed to have the same effect for all purposes of this lease as a well drilled from a surface location on the leased area. In such circumstances, drilling shall be considered to have been commenced on the nearby land for the purposes of this lease, and production of geothermal resources from the leased area through any directional well located on nearby land, or drilling or reworking of any such directional well shall be considered production or drilling or reworking operations (as the case may be) on the leased area for all purposes of this lease. Nothing contained in this section shall be construed as granting to the Lessee any right in any land outside the leased area.

Sec. 20. OVERRIDING ROYALTIES – The Lessee shall not create overriding royalties of less than one-quarter (1/4) of one percent of the value of output nor in excess of 50 percent of the rate of royalty due to the Lessor specified in Sec. 3 of this lease except as otherwise authorized by the regulations. The Lessee expressly agrees that the creation of any overriding royalty which does not provide for a prorated reduction of all overriding royalties so that the aggregate rate of royalties does not exceed the maximum rate permissible under this section, or the failure to suspend an overriding royalty during any period when the royalties due to the Lessor have been suspended pursuant to the terms of this lease, shall constitute a violation of the lease terms.

Sec. 21. READJUSTMENT OF TERMS AND CONDITIONS – The terms and conditions of this lease other than those related to rentals and royalties may be readjusted in accordance with the Act at not less than ten-year intervals beginning ten (10) years after the date geothermal steam is produced from the leased premises as determined by the Supervisor.

Sec. 22. COOPERATIVE OR UNIT PLAN – The Lessee agrees that it will on its own, or at the request of the Lessor where it is determined to be necessary for the conservation of the resource or to prevent the waste of the resource, subscribe to and operate under any reasonable cooperative or unit plan for the development and operation of the area, field, or pool, or part thereof embracing the lands subject to this lease as the Secretary may determine to be practicable and necessary or advisable in the interest of conservation. In the event the leased lands are included within a unit, the terms of this lease shall be deemed to be modified to conform to such unit agreement. Where any provision of a cooperative or unit plan of development which has been approved by the Secretary, and which by its terms affects the leased area or any part thereof, is inconsistent with a provision of this lease, the provisions of such cooperative or unit plan shall govern.

Sec. 23. RELINQUISHMENT OF LEASE – The Lessee may relinquish this entire lease or any officially designated subdivision of the leased area in accordance with the regulations by filing in the proper BLM office a written relinquishment, in triplicate, which shall be effective as of the date of filing. No relinquishment of this lease or any portion of the leased area shall relieve the Lessee or its surety from any liability for breach of any obligation of this lease, including the obligation to make payment of all accrued rentals and royalties and to place all wells in the leased lands to be relinquished in condition for suspension or abandonment, and to protect or restore substantially the surface or subsurface resources in a manner satisfactory to the Lessor.

Sec. 24. REMOVAL OF PROPERTY ON TERMINATION OR EXPIRATION OF LEASE

(a) Upon the termination or expiration of this lease in whole or in part, or the relinquishment of the lease in whole or in part, as herein provided, the Lessee shall within a period of ninety (90) days (or such longer period as the Supervisor may authorize because of adverse climatic conditions) thereafter remove from the leased lands, no longer subject to the lease all structures, machinery, equipment, tools, and materials in accordance with applicable regulations and orders of the Supervisor. However, the Lessee shall, for a period of not more than six (6) months, continue to maintain any such property needed in the relinquished area, as determined by the Supervisor, for producing wells or for drilling or producing geothermal resources on other leases.

(b) Any structures, machinery, equipment, tools, appliances, and materials, subject to removal by the Lessee, as provided above, which are allowed to remain on the leased lands shall become the property of the Lessor on expiration of the 90-day period or any extension of that period which may be granted by the Supervisor. If the Supervisor directs the Lessee to remove such property, the Lessee shall do so at its own expense, or if it fails to do so within a reasonable period, the Lessor may do so at the Lessee's expense.

Sec. 25. REMEDIES IN CASE OF DEFAULT

(a) Whenever the Lessee fails to comply with any of the provisions of the Act, or the terms and stipulations of this lease, or of the regulations issued under the Act, or of any order issued pursuant to those regulations, and that default shall continue for a period of thirty (30) days after service of notice by the Lessor, the Lessor may (1) suspend operations until the requested action is taken to correct the noncompliance, or (2) cancel the lease in accordance with Sec. 12 of the Act (30 U.S.C. 1011). However, the 30-day notice provision applicable to this lease under Sec. 12 of the Act shall also apply as a prerequisite to the institution of any legal proceedings by the Lessor to cancel this lease while it is in a producing status. Nothing in this subsection shall be construed to apply to, or require any notice with respect to any legal action instituted by the Lessor other than an action to cancel the lease pursuant to Sec. 12 of the Act.

(b) Whenever the Lessee fails to comply with any of the provisions of the Act, or of this lease, or the regulations, or of any GRO Orders, or other orders, and immediate action is required, the Lessor without waiting for action by the Lessee may enter on the leased lands and take such measures as it may deem necessary to correct the failure, including a suspension of operations or production, all at the expense of the Lessee.

(c) A waiver of any particular violation of the provisions of the Act, or of this lease, or of any regulations promulgated by the Secretary under the Act, shall not prevent the cancellation of this lease or the exercise of any other remedy or remedies under paragraphs (a) and (b) of this section by reason of any other such violation, or for the same violation occuring at any other time.

(d) Nothing herein shall limit or affect the Lessee's right to a hearing and appeal as provided in Sec. 12 of the

Act and in the regulations promulgated thereunder.

(c) Upon cancellation, the Lessee shall remove all property in accordance with Sec. 24 hereof, and shall restore the leased lands in a manner acceptable to the Lessor or as may be otherwise required by the Lessor.

Sec. 26. HEIRS AND SUCCESSORS IN INTEREST – Each obligation hereunder shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns, of the respective parties hereto.

Sec. 27. UNLAWFUL INTEREST – No Member of, or Delegate to Congress, or Resident Commissioner, after his election or appointment, either before or after he has qualified, and during his continuance in office, and no officer, agent, or employee of the Department shall be admitted to any share or part in this lease or derive any benefit that may arise therefrom; and the provisions of Sec. 3741 of the Revised Statutes (41 U.S.C. Sec. 22), as amended, and Sections 431, 432, and 433 of Title 18 of the United States Code, relating to contracts made or entered into, or accepted by or on behalf of the United States, form a part of this lease so far as the same may be applicable.

Sec. 28. MONOPOLY AND FAIR PRICES – The Lessor reserves full power and authority to protect the public interest by promulgating and enforcing all orders necessary to insure the sale of the production from the leased lands at reasonable prices, to prevent monopoly, and to safeguard the public interest.

Sec. 29. EQUAL OPPORTUNITY CLAUSE – The Lessee agrees that, during the performance of this contract:

(1) The Lessee will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Lessee will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Lessee agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Lessor setting forth the provisions of this Equal Opportunity clause.

(2) The Lessee will, in all solicitations or advertisements for employees placed by or on behalf of the Lessee, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(3) The Lessee will send to each labor union or representative of workers with which Lessee has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Lessor, advising the labor union or workers' representative of the Lessee's commitments under this Equal Opportunity clause, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Lessee will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, as amended, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the Secretary of the Interior and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Lessee's noncompliance with the Equal Opportunity clause of this lease or with any of said rules, regulations, or orders, this lease may be canceled, terminated or suspended in whole or in part and the Lessee may be declared ineligible for further Federal Government contracts or leases in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, as amended, and such other sanctions as may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, as amended, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Lessee will include the provisions of Paragraphs (1) through (7) of this Section (29) in every contract, subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, as amended, so that such provisions will be binding upon each contractor, subcontractor, or subcontract, or purchase order as the Secretary may direct as a means of enforcing such provisions including sanctions for noncompliance; *provided, however,* that in the event the Lessee becomes involved in, or is threatened with, litigation with a contractor, subcontractor, or vendor as a result of such direction by the Secretary, the Lessee may request the Lessor to enter into such litigation to protect the interests of the Lessor.

Sec. 30. CERTIFICATION OF NONSEGREGATED FACILITIES – By entering into this lease, the Lessee certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The Lessee agrees that a breach of this certification is a violation of the Equal Opportunity clause of this lease. As used in this certification, the term "segregated facilities" means, but is not limited to, any waiting rooms, work areas, rest rooms and wash rooms, or restaurants or other eating areas, time clocks, or locker rooms, and other storage or dressing rooms, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise. Lessee further agrees that (except where it has obtained identical certifications from proposed contractors and subcontractors for specific time periods) it will obtain identical certifications from proposed contractors and subcontractors prior to the award of contracts or subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause; that it will retain such certifications in its files; and that it will forward the following certification to such proposed contractors and subcontractors (except where the proposed contractor or subcontractor has submitted identical certifications for specific time periods); it will notify prospective contractors and subcontractors of requirement for certification of nonsegregated facilities. A Certification of Nonsegregated Facilities, as required by the May 9, 1967 Order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a contract or subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each contract and subcontract or for all contracts and subcontracts during a period (i.e., quarterly, semiannually, or annually).

Sec. 31. SPECIAL STIPULATIONS – *(stipulations, if any, are attached hereto and made a part hereof)*

In witness whereof the parties have executed this lease.

Lessee:

_____
(Signature of Lessee)

_____
(Signature of Lessee)

[SEAL] (Date)

THE UNITED STATES OF AMERICA, Lessor:

By _____
(Authorized Officer)

_____
(Title)

_____
(Date)

GPO 853 - 471

APPENDIX IV

6111 - QUALITY EVALUATION OF RECREATION USE OPPORTUNITIES

.01 Purpose. This section describes the methodology for completing an extensive quality evaluation of recreation use opportunities on Bureau administered lands.

.02 Objectives. The objective of this evaluation process is to determine on a relative scale the inherent recreation use value of the natural and cultural resources managed by the Bureau.

.03 Authority. (See 6000.03.)

.04 Responsibility. (See 6100.04.)

.05 Definitions. (See 6000, Glossary of Terms.)

A. Rating Area: the basic unit for which Quality Evaluation Ratings are completed. A rating area may be:

1. A large or small area which falls within certain definable boundaries such as an historic district, a lake, etc.

2. A point-oriented feature such as a small archeological ruin.

3. A linear feature such as a stream.

.06 Policy. (Reserved)

.07 The Concept. The natural and cultural resources managed by the Bureau have "inherent" recreation use values that can be accurately measured without considering location, existing or potential use levels, or proximity to roads, population centers, etc. For example, archeological site #1 which is in a remote and isolated location may have a greater inherent value for recreation use (sightseeing) because it is bigger, better preserved, etc. than archeological site #2 which is next to a road or close to a population center. The inherent value is measured entirely from the recreation user's point of view without considering the effect this use may have on the resource or other resource uses. The inherent value is recorded by giving an area a quality rating of "A", "B", or "C" ("A" being the highest). A resource can have different values for different kinds of uses: for example, a body of water may have:

- "C" value for fishing.
- "B" value for water fowl hunting.
- "A" value for powerboating and waterskiing.
- "A" value for sightseeing.

Quality ratings are based on the resource conditions as they exist during the primary visitor use season. The rating system is structured to limit "A" designations to the truly outstanding areas.

6111 - QUALITY EVALUATION OF RECREATION USE OPPORTUNITIES

Quality Evaluation Chart for Sightseeing - Scenery

Quality Evaluation Chart

SCENERY

KEY FACTORS	RATING CRITERIA AND SCORE		
① LAND FORM	Vertical or near vertical cliffs, spires, highly eroded formations, massive rock outcrops, severe surface variation. 4	Steep canyon walls, mesas, interesting erosional patterns, variety in size & shape of land forms. 2	Rolling hills, foothills, flat velley bottoms. 1
② COLOR	Rich color combinations variety or vivid contrasts in tha color of soil, rocks, vegetation or water. 4	Some variaty in colors and contrast of the soil, rocks & vegetation, but not dominant. 2	Subtle color varieties, little contrast, generally muted tones. Nothing really eye-catching. 1
③ WATER	Still, chanca for reflections or cascading white water, e dominant factor in the landscape. 4	Moving and in view or still but not dominant. 2	Absent or present but seldom seen. 1
④ VEGETATION	A harmonious variation in form, texture, pattern, and type. 4	Some variation in pattern and texture, but only one or two major types. 2	Little or no variation, contrast lacking. 1
⑤ UNIQUENESS	One of a kind or very rare within region. 6	Unusual but similar to others within the region. 2	Interesting in its setting, but fairly common within the region. 1
⑥ INTRUSIONS	Free from aesthetically undesirable or discordant sights and influences. 2	Scenic quality is somewhat depreciated by inharmoneous intrusions but not so extensive that the scenic quelities ere entirely negated. 1	Intrusions are so extensive that scenic qualities ere for the most part nullified. -4

A = 15-24 B = 10-14 C = 1-9

EXPLANATION OF RATING CRITERIA

① Land Form or topography becomes more interesting as it gets steeper and more massiva. Examples of outstanding land forms are found in Grand Canyon, the Sawtooth Mountain Range in Idaho, the Wrangla Mountain Range in Alaska, Rocky Mountain National Park, etc.

② Color. Consider the overall color of the basic components of the landscape (i.a., soil, rocks, vegetation, etc.) as they appear during tha high use season. Key factors to consider in rating "color" are variety, contrast, and harmony.

③ Water is that ingredient which adds movement or serenity to a scena. The degree to which water dominates the scene is the primary consideration in selecting tha rating score.

④ Vegetation. Give primary consideration to the variety of patterns, forms, and textura created by the vegetation.

⑤ Uniqueness. This factor provides an opportunity to give added importance to one or all of the scenic featuras that appear to be relatively unique within any one physiographic region. There may also be cases where a separata evaluation of each of the key factors does not give e true pictura of tha overall scenic quality of an area. Often it is e number of not so spectacular elements in the proper combination that produces tha most pleasing scenery -- the uniqueness factor can be used to recognize this type of area and give it tha added emphasis it needs.

⑥ Intrusions. Consider the impact of man-made improvements on the aesthetic quality. These intrusions can have a positive or negative aesthetic impact. Reta eccordingly.

INSTRUCTIONS (See Sec. .1 for general procedures)

Purpose: To rate the aesthetic quality of the scenic resource on all BLM lands.

How to Identify Scenery Value: All Bureau lands have scenic value.

How to Determine Minimum Suitability: All BLM lands are rated for scenic values. Also rate adjacent or intermingling non-BLM lands.

How to Delineate Rating Areas: Consider the following factors when delineating rating areas:

1. Like physiographic characteristics (i.e., land form, vegetation, etc.
2. Similar visual patterns, texture, color, variety, etc.
3. Areas which have a similar impact from intrusions (i.e., roads, structures, mining operations, or other surface disturbances).

6111 - QUALITY EVALUATION OF RECREATION USE OPPORTUNITIES

Quality Evaluation Chart for Sightseeing - Zoological

Quality Evaluation Chart

ZOOLOGICAL

KEY FACTORS	RATING CRITERIA AND SCORE			
(1) *FREQUENCY OF OCCURRENCE	(2) Unique 4+	Rare 3	Uncommon 2	Common 1
(3) *QUANTITY	Very high density 4	High density 3	Moderate density 2	Low density 1
(4) *CURIOSITY AROUSING	Very high very different unusual odd 4	High strange different 3	Moderate interesting attractive 2	Low dull drab 1
EASE OF (5) OBSERVATION	Excellent 4	Good 3	Fair 2	Poor 1
(6) TYPE	Large mammals 4	Small Mammals birds or mixture 3	Reptiles 2	Other 1
(7) VARIETY	8 or more species 4	4-7 Species 3	2-3 Species 2	One Species 1

* Compared to other similar type features in the region.

A = 24-20 B = 19-15 C = 14- 6

EXPLANATION OF RATING CRITERIA

(1) Frequency of Occurrence. The relative occurrence of the feature within the region.

(2) Unique. A feature may be unique in a region but still not have great visitor appeal. On the other hand, a feature may rate out low in one or more of the key factors but in combination it may be unique and have outstanding visitor appeal. The rater has the option to add whatever points in this area he feels are necessary to give a feature a valid rating. Any score beyond 4 must be explained in the remarks column of the Rating Score Sheet.

(3) Quantity. Refers to the density and number of animals compared to other similar zoological sites in the region.

(4) Curiosity Arousing. The degree of curiosity an animal or animal community creates in the mind of a visitor who sees it for the first time. Curiosity may be enhanced by anything that appeals to any of the five senses (i.e., sight, smell, feel, taste, and hearing).

(5) Ease of Observation. Refers to the relative ease of viewing the animals. Do they stay under cover during the daylight hours? Do they congregate in one place during certain times of the day?

(6) Type of Species. The type of species a visitor could expect to see at a given location during the visitor use season.

(7) Variety of Species. The number of species a visitor could expect to see at a given location during the visitor use season.

INSTRUCTIONS (See Sec. .1 for general procedures)

Purpose: To rate the quality of experience a sightseer can expect while viewing a given zoological feature.

How to Identify Zoological Values: Consider all animals having special human interest value. Zoological values that should be considered include, but are not limited to, the following:

1. Areas where rare, unusual, or high interest animals can consistently be viewed.
2. Areas where it is technically possible to set up a management program for observing animals in their natural habitats.
3. Areas which seasonally have high concentrations of animal life.
4. Areas having an unusual mix of animal species.

How to Determine Minimum Suitability: A zoological site should have one or more of the following characteristics to qualify for rating:

1. Be a site recognized by professional groups or individuals as having special wildlife observation values.
2. Be a site where it is technically possible to set up a program for observing zoological features in their natural habitat.
3. Be a zoological feature creating a high interest level for most visitors.

How to Delineate Rating Areas: Delineate the prime observation areas and rate each area separately. A zoological rating area may be several hundred acres or less than an acre.

Other Considerations: The primary factor being rated is the degree of interest a zoological feature creates. Scientific values are considered only to the extent they contribute to the human interest values.

APPENDIX V

MONTANA BUREAU OF MINES AND GEOLOGY

BUTTE, MONTANA 59701

OFFICE OF THE DIRECTOR

May 2, 1975

Mr. C. Rex Cleary, District Manager
Billings District Office
U. S. Bureau of Land Management
P. O. Box 2020
Billings, Montana 59103

Dear Mr. Cleary:

Thank you for your letter of April 29, and attached lease application for Hunter's Hot Springs Area.

This area is one that received some early attention from this Bureau. The Madison Limestone is about 8,000 ft. below the surface, it is cavernous, and it carries water. If the heat source is present at depth, as we think it is, the area has geothermal potential. The Hunter Hot Springs are evidence of a heat source somewhere in that general area but are not, in my opinion, connected with a possible geothermal system in the Madison at great depth.

I recommend leasing the area. In fact, I strongly recommend it. The known potentials should be tested, and the sooner the better.

As a final thought, the exploration phase of geothermal activity should have no adverse effects on the environment.

Sincerely,

S. L. Groff, Director
and State Geologist

SLG:eh

Copy to Mr. R. E. Matson

Enclosure

POTENTIAL GEOTHERMAL RESOURCES IN MONTANA

by C. A. Balster[1/] and S. L. Groff[2/]

INTRODUCTION

Montana has within its borders a part of the earliest known geothermal area in our country. First known as "Colter's Hell", it was later set aside as Yellowstone National Park. Despite the early recognition of natural thermal energy in the region, there has been little or no active exploration for usable geothermal resources. Probably the best explanation for lack of emphasis is the relatively low demand for electrical power. The population density is low and industrial requirements are equally low. Electrical energy from water and from fuel-fired generators has been adequate. Power demands of the future may be expected to require additional sources of energy.

GEOTHERMAL RESOURCES

Only one area in Montana has been classed as a known geothermal resource area (Godwin and others, 1971). It is in the extreme southern part of Montana, near Yellowstone Park (Fig. 1). The KGRA includes 12,763 acres but no exploratory efforts to prove the resource potential have been attempted.

An additional 3,834,000 acres has been classed as prospective areas of geothermal resource value (U. S. Geol. Survey, 1971).

1/Research petroleum geologist, Montana Bureau of Mines and Geology, Billings office.

2/Acting director and state geologist, Montana Bureau of Mines and Geology, Butte.

Comparatively, this is not a large area, and Montana ranks ninth among fourteen states in prospective geothermal resources.

Many areas in Montana were sites of Tertiary volcanic or intrusive activity. Normal faulting is common throughout the western half of the state, and many of the mountain ranges in western Montana are fault-block mountains. High-volume aquifers such as the carbonate rocks of the Madison Group (Mississippian) and the conglomeratic and coarse sandstone units of the Dakota Group (Cretaceous) underlie much of the state. Thus, the basic components for geothermal systems of economic significance are widespread.

Many areas in the state are characterized by thermal springs (Table 1). Some of these springs have very large flows, but temperatures are generally not high.

The upper Yellowstone River valley has numerous thermal springs. Some of them were used as recreational facilities for many years (Chico is the only one now in use). Late Tertiary intrusive bodies in the Beartooth Mountains area are the probable source of the thermal energy, but Tertiary volcanic activity in the Crazy Mountains basin may also be a source. Faults or fault systems generally provide the avenues for escape of the hot waters to the surface.

One large thermal spring (Big Warm Springs) is known in the Mocassin-Judith Mountains area. It is on the north flank of the South Mocassin Mountains. According to local historians, Flat Mountain, on the southern end of the Judith Mountains, also had a thermal spring but it became inactive early in the 20th century. The obvious sources of heat for thermal springs in the area are the laccolithic intrusions

of Tertiary age. Here too, faults are the probable avenues of escape for the heated waters.

Several warm springs around the margins of the Little Rocky Mountains flow moderate volumes of water. Temperatures are generally less than 100°F. The Tertiary intrusive mass that forms the core of the Little Rockies may be the source of the heat. Most of the springs issue from limestone of the Madison Group (Mississippian) or from faults that can serve to conduct the warm waters from the Madison to the surface.

Early settlers in the White Sulphur Springs area noted the local thermal spring when they named their city. The source of heat is probably the nearby Castle Mountains intrusive body or a related body of cooling rock. Unknown high-angle faults or fractures probably provide the escape route for the water, and a major thrust fault is believed to underlie the city.

The Boulder batholith occupies a relatively large area that was the site of prolonged volcanic and intrusive activity during and after Cretaceous time. Several thermal springs are associated with the Boulder batholith, most of them emanating along fault zones. The area is known to contain some anomalous thermal gradients, and if sufficient concentrations of heat and of permeable zones could be encountered, prospective energy areas might be outlined.

Just west of the Boulder batholith, the eastern part of the Idaho batholith projects into Montana. Intrusion of the Idaho batholith took place late in Cretaceous time, but thermal springs are known within its boundaries. Heat is still emanating from the cooling rocks. The presence of adequate permeable reservoirs in the igneous rock is doubtful, however.

An area of thermal potential just south of the Boulder-Idaho batholith could be called the Beaverhead area. It is a terrane of Tertiary-Cretaceous volcanic and intrusive activity that was probably associated with the Boulder batholith. Heat for thermal springs is probably derived from relatively deep seated intrusive rocks. Recent deep drilling related to uranium exploration has detected warm water at depth in the Big Hole Valley, and at least one well was reported to flow at the surface from an aquifer in Tertiary sedimentary rocks.

Some distance west of the Yellowstone Park area is an area of potential geothermal value known as the "Snowcrest-Gravelly Range" area. It is underlain by rocks ranging in age from Precambrian to Cretaceous. No extrusive or intrusive rocks crop out, and a source of heat must be attributed to a deep seated igneous intrusion. Considering the relationship of the area to the Yellowstone Park province, such an intrusive mass could most logically be associated with the Yellowstone Park volcanic rocks.

Several wells in the state have flowed hot water from various aquifers, but most of the large flows have been from rocks of the Madison Group. These flows of hot water are indicative of anomalous heat-flow conditions. Specific wells are too numerous to mention, but notable areas from which flows of hot water have been obtained include the Montaqua area near Joliet (no. 30), McLeod (no. 28), Saco (no. 32), and reportedly from the Lake Basin fault zone near Billings.

Major thrust-fault systems along the northern Rocky Mountain Front and in western and probably in southwestern Montana offer some

potential for geothermal exploration, particularly in areas near Tertiary intrusive bodies.

Abundant information from geophysical logs of wells drilled for oil and gas is available for most of Montana east of the continental divide. Although not absolutely accurate, such data may be used to construct usable maps.

EXPLORATION ACTIVITY

Montana has had very little exploration for geothermal energy. Some thermal measurements have reportedly been made, but the results are not available. Interest in the possibility of developing geothermal resources, to the best knowledge of the writers, is not very intense. Some thought has been given to the Hunter Hot Springs area (Fig. 1, Table 1, no. 27), where the Madison Limestone may be on the order of 8,000 feet below the surface. Tentative proposals made by the Montana Bureau of Mines and Geology to private industry relating to drill-hole exploration of the Hunter Hot Springs area have not yet been accepted. As of this writing, the Bureau has made no proposals relative to any other sites.

A program of thermal (heat flow) measurements is needed in Montana, but the Tertiary and Cretaceous deposits in many structural basins probably effectively mask potential sources of geothermal energy.

ELECTRICAL POWER IN MONTANA

Electrical power is generated in Montana both by hydro and by thermal plants. Statewide consumption in calendar 1970 was 998.3 MW (hydro) and 146.2 MW (thermal). Private utilities

generated 573.8 MW (hydro) and all the thermal power. Additional electrical power is brought into the southern part of western Montana from the Bonneville system, but on the other hand, power is exported from the Fort Peck, Yellowtail, Canyon Ferry, and Hungry Horse hydro generation facilities of the federal government. Washington Power and Light Co. generates hydro power at Noxon on the lower Clark Fork and this is all for export to the west.

Eastern Montana contains the major strippable coal reserves of the vast Fort Union coal region. It is estimated that sufficient water and coal are available for generation of 15,000 MW for export north, east, and south. Western Montana may be able to generate geothermal power for local use and for export to the west. Depending, of course, on successful exploration for geothermal sources.

Montana, in a future sense, must be considered as a power exporting area rather than as a power using area.

REGULATION OF DEVELOPMENT

No specific legislation has been promulgated to regulate development of geothermal resources. The Montana Oil and Gas Conservation Commission would be expected to have regulatory authority over drilling of exploratory wells. Production and marketing of power would no doubt be under the jurisdiction of the Railroad and Public Service Commission, the F.P.C., or both.

Most of the Montana land having potential for development is under federal control. The U. S. Department of Agriculture, through the Forest Service, and the U. S. Department of the Interior, through the Bureau of Land Management, control an estimated 70

percent of the prospective area. Lease requirements are outlined in the Geothermal Steam Act of 1970, Public Law 91-581 (Godwin and others, 1971).

Leasing of state-owned lands would come under the jurisdiction of the Department of State Lands, Helena, Montana. There is no known policy on leasing of prospective geothermal acreage.

SUMMARY

Exploration for geothermal resources in Montana is in its infancy, although the area has long been known for its geothermal features. One known geothermal resource area is included in the state, and sizable tracts of land are regarded as suitable areas for prospecting.

REFERENCES CITED

Godwin, L. H., Haigler, L. B., Rioux, R. L., White, D. E., Muffler, L. J. P., and Wayland, R. G., 1971, Classification of public lands valuable for geothermal steam and associated geothermal resources: U. S. Geol. Survey Circ. 647, 18 p.

U. S. Geological Survey, 1971, Western states rich in geothermal potential: U. S. Dept. Interior news release, October 6.

Waring, G. A., 1965, Thermal springs of the United States and other countries of the world--A summary: U. S. Geol. Survey Prof. Paper 492, 383 p. (Revised by R. R. Blankenship and Ray Bentall.)

Figure 1.—Map of Montana showing thermal springs and lands classified for geothermal resources as of December 24, 1970. Numbers correspond to thermal springs listed in Table 1.

Table 1.--Montana thermal springs

		Temp ^{o}F	Flow, gpm
1.	Paradise	warm	---
2.	Camas	128	not meas
3.	Lolo	112 - 118	50
4.	Horse Creek (Idaho)	not meas	not meas
5.	Medicine	120	100
6.	Gallogly	120	100
7.	Sleeping Child	122 - 127	115
8.	Jackson	134	not meas
9.	Elkhorn	118	400±
10.	Gregson	128 - 190 (rep.)	not meas
11.	Warm Springs	160	60+
12.	New Biltmore	126	100+
13.	Barkells	156	150 est
14.	Pipestone	134	200 est
15.	Boulder	160+	250 est
16.	Broadwater	138	75
17.	Alhambra	124	150 - 200
18.	Potosi	75±	10
19.	Norris	140±	not meas
20.	Bedford	74	1,400
21.	Bozeman	120	not meas
22.	White Sulphur	115±	not meas
23.	Ringling (drill hole)	126±	1,200
24.	Corwin	abandoned	
25.	Mammoth (Yellowstone Park)	---	---
26.	Chico	119	not meas
27.	Hunter	142 - 146	3,000
28.	McLeod (drill hole)	120±	60±
29.	Big Warm Springs	70	50,000
30.	Montaqua (drill hole)	114	abandoned
31.	Little Warm Springs	warm	not meas
32.	Saco (drill hole)	118 (rep.)	abandoned

RESPONSE TO DESCRIPTION
OF THE PROPOSED ACTION
HUNTERS HOT SPRINGS
GEOTHERMAL LEASE APPLICATION

Comments from: S. L. Groff, Montana Bureau of Mines and Geology; letter of May 2, 1975

No discussion necessary.

Department of Health and Environmental Sciences
STATE OF MONTANA HELENA, MONTANA 59601

John S. Anderson M.D.
DIRECTOR

May 2, 1975

Mr. C. Rex Cleary
District Manager
U.S. Dept. of Interior
Bureau of Land Management
Billings District Office
P.O. Box 2020
Billings, MT 59103

Dear Mr. Cleary:

The following comments apply to the possible geothermal development in the vicinity of Springdale, Montana.

It appears as though this development will have little effect on the air quality of the Livingston area. Possible introduction into the atmosphere of particulates, trace elements, and gases such as hydrogen sulfide will require attention be paid to Montana and federal ambient air quality standards. Since little is known of the exact pollutants or quantities of pollutants that will be emitted, effluent measurements will be required. We would like to receive copies of all these measurements as they are completed.

If you have any further questions, please feel free to contact me.

Sincerely,

James W. Gelhaus

James W. Gelhaus
Air Pollution Meteorologist
Air Quality Bureau

JWG:js

RESPONSE TO DESCRIPTION
OF THE PROPOSED ACTION
HUNTERS HOT SPRINGS
GEOTHERMAL LEASE APPLICATION

Comments from: James W. Gelhaus, Department of Health and Environmental Sciences, State of Montana; letter of May 2, 1975

Paragraph 2 refers to concern about atmospheric pollution and monitoring. Impact on air quality is discussed in section IV, B, page 42; section VI, B, page 69; section V, 2, page 64; and in GRO Order No. 4.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
711 Central Avenue
Billings, Montana 59102

3200

RECEIVED
MAY 12 '75
B.L.M. Billings Dist.

May 9, 1975

MEMORANDUM

To: District Manager, Bureau of Land Management, 810 Main, Billings, Montana 59101

From: Acting Area Manager (ES)

Subject: Bureau of Land Management's Geothermal Leasing Program - Recommendations for Protecting Fish and Wildlife during Exploration and Development of Geothermal Resources in Hunters Hot Springs Leasing Area, Montana

In response to your letter dated April 29, 1975, and in an effort to further our mutual responsibilities in subject leasing program, we are furnishing you with some preliminary recommendations designed to protect, maintain, and possibly enhance the wildlife and fisheries resources in subject area.

I. General Recommendations

A. Critical wildlife habitat areas essential to the well-being of populations of one or more species of fish and/or wildlife are considered to be environmentally sensitive areas that should be excluded from all surface activity associated with geothermal exploration and development. Such areas include for the Hunters Hot Springs Leasing Area: water sources, water courses; riparian vegetation; raptor nesting areas; and identified critical niches in antelope, deer and grouse range, such as kidding and fawning grounds, strutting grounds, brooding areas, and key winter range.

B. Any habitat known to be used by Endangered or Threatened species should be carefully excluded from exploration and development.

C. There should be established an interagency program for identifying the critical habitats referred to in items A and B and for censusing populations of fish or other fauna where data are insufficient.

D. For those adverse impacts on fish and wildlife resources determined to be unavoidable, measures should be adopted to satisfactorily compensate for such damage. These measures should be

incorporated into development plans and operating criteria.

E. A long-range interagency monitoring program should be established to evaluate effects on fish and wildlife of toxic wastes associated with development and of impacts due to human disturbance factors. This long-range program should also be designed to develop a data bank on overall wildlife populations and trends.

II. Recommendations Specific to Species or Faunal Groups

A. Antelope

1. No surface disturbance or intrusion should be allowed in a kidding ground or within a mile-wide buffer zone around a kidding zone.

2. For total range of species, surface disturbances should be designed for minimal impacts.

3. Temporary roads should be closed when no longer needed and the road areas restored to pre-project conditions (revegetated).

4. Construction of facilities (pipelines, fences, etc.) should be designed so they will not interfere with antelope movement.

B. Deer

1. No surface disturbance or intrusion should be allowed in critical winter or summer ranges.

2. For total range of species, surface disturbances should be designed for minimal impacts.

3. Construction of facilities (pipelines, fences, etc.) should be designed so they will not interfere with deer movement.

C. Grouse

1. Strutting grounds and breeding areas should be fully protected.

2. No surface disturbance or intrusion related to geothermal development should be allowed within a 2-mile radius of strutting grounds.

3. Brooding areas and wintering grounds should be protected from intrusion.

D. Pheasant and Hungarian Partridge

1. Areas of known nesting concentrations should not be disturbed during the nesting season.

2. Wintering areas (including protective cover) should not be disturbed.

3. For total ranges of species, surface disturbances should be designed for minimal impacts.

E. Raptors

1. Powerlines, including towers, should be so designed and so arranged that their threat to raptors is minimized.

F. Fisheries

1. No work should be done in any streams. Adequate buffer zones, of at least 750 feet, should be established adjacent to the Yellowstone River.

2. Waste discharge requirements should be designed to adequately protect water quality and related fish populations.

3. All water extracted from the wells should be reinjected back into the ground instead of discarding it in the surrounding watershed. This should help protect the high quality of the Yellowstone River.

4. Since studies have revealed that drilling activities, road construction, and waste disposal can adversely impact aquatic organisms and habitat through increased turbidity and sedimentation, addition of toxic materials, blockage of fish movements, and physical alteration of the stream environment, extreme care should be exercised to preserve the high quality of the Yellowstone River.

G. Endangered or Threatened Species

1. All endangered or threatened wildlife species should be provided the protection necessary for their survival, in compliance with the 1973 Endangered Species Act (Public Law 93-205, 87 Stat. 884).

2. There should be an intensive effort to determine if any endangered or threatened fish and wildlife species exist in or use the area. If any are discovered, a program to determine their status and habitat needs should be established. For example: should endangered

birds of prey be found, there should be a concerted effort to locate and map all aeries, determine nesting success, and develop a management plan for each nesting territory.

3. In the case of the occurrence of any animal that the Secretary of the Interior or the appropriate State fish and game management agency lists as "Endangered" or "Threatened", there should be established a "critical habitat zone" (CHZ) to ensure the protection of said animal; such zone generally to consist of an area exempt from any and all leases within a safe distance (depending on species), and held inviolate to any intrusion except under special authorization by the land managing agency, with concurrence from the appropriate State fish and game agencies and the U. S. Fish and Wildlife Service. An exception, for example, could be a biologist's entering the zone for the purpose of obtaining scientific data. The actual size and location of the "critical habitat zone" should be determined jointly by personnel from the appropriate State fish and game agency and the U. S. Fish and Wildlife Service upon an evaluation of the topography, vegetation, and specific needs of the species involved; and the establishment of these zones should be done on an individual site-by-site basis.

4. If, at a later date, the size or location of a "critical habitat zone" should be found to be inadequate, a reevaluation should be made so that adequate protection will be provided the species involved, even though lease revocation may be required.

5. There should be a continuing, coordinated effort by the U. S. Fish and Wildlife Service, the appropriate State fish and game managing agencies, and the specific land management agency involved, to periodically survey and inventory populations within the critical habitat zones to determine the status of endangered and threatened species and to locate any new nests, roosts, or other critical areas so that these too will be protected.

We would be happy to discuss these recommendations at your convenience. As more specific data are collected by this office concerning geothermal development impacts in this area, these will be provided to you.

James C. Salinas

James C. Salinas

cc:
State Director, Bureau of Land Management, Federal Bldg., Billings 59101
U. S. Geological Survey, P.O. Box 1818, Billings, Montana 59103
Montana Department of Fish and Game, 1125 Lake Elmo Drive, Billings 59101

RESPONSE TO DESCRIPTION
OF THE PROPOSED ACTION
HUNTERS HOT SPRINGS
GEOTHERMAL LEASE APPLICATION

Comments from: James C. Salinas, Acting Area Manager, U. S. Fish and Wildlife Service; letter of May 9, 1975

Item I refers to general recommendations. Paragraph A recommends exclusion of sensitive areas from surface activity. This is discussed in section V, 5, page 66; V, 4, page 66; Appendix VII; and GRO Order No. 4.

Paragraph B recommends exclusion of endangered or threatened species habitat. This is discussed in section II, A, 8, page 32.

Paragraph C recommends program to identify critical habitat. This process is a continual program within the federal and state agencies and will increase as the geothermal interest in this area increases.

Paragraph D refers to unavoidable impacts upon wildlife. Refer to the discussion in GRO Order No. 4, section 6, Biota.

Paragraph E recommends a long range monitoring program. This will be an automatic consideration within federal and state agencies. Additionally, refer to GRO Order No. 4, section 10, Water Quality.

Item II refers to recommendations specific to species or faunal groups.

A. Antelope

1. This paragraph refers to kidding grounds. No kidding grounds were identified by the State Fish and Game Department on the lease tracts or within the Study Area.

2. This paragraph refers to total antelope range. Stipulations are designed to minimize impacts on the lease tracts. Refer to section V, page 61, and Appendix III.

3. This paragraph refers to road construction. This is discussed in section II, C, 4, pages 10, 11, and 18; throughout the Environmental Impacts section; section V, 1, page 61, section V, 6, page 67; and GRO Order No. 4.

4. This paragraph refers to antelope movement. This problem is recognized in section VI, H, page 70 and in section V, page 67.

B. Deer

Paragraphs 1 and 2 refer to surface disturbance. This is discussed in section V, page 61, Appendix III, and specifically in section V, page 66 and 67.

Paragraph 3 refers to construction of facilities. This is discussed in section VI, H, page 70 and section V, page 67.

C. Grouse

These paragraphs refer to strutting, breeding, brooding and wintering grounds. These areas were not identified on the lease tracts or adjacent to the lease tracts by the Montana Fish and Game Department.

D. Pheasant and Hungarian Partridge

These paragraphs refer to specific areas and total range of the above species. These areas are not specifically identified as occuring on the lease tracts. Mitigations are covered in section V, page 61, and Appendix III.

E. Raptors

This paragraph refers to minimizing the threat to raptors. This is discussed in section V, 4, page 66 and Appendix VII.

F. Fisheries

1. This paragraph refers to streams and buffer zones. No streams occur on the lease tracts or with 750 feet of the lease tracts.

2. Waste discharge. This is discussed in section V, 2, pages 61-66, and Appendix III.

3. Water reinjection. This is also discussed in section V, 2, pages 61-66, and Appendix III.

4. Preserving high quality of Yellowstone River. This is discussed in section V, and Appendix III.

G. Endangered and Threatened Species

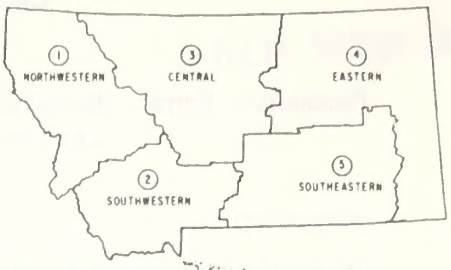
Paragraphs 1 - 5 are discussed in section V page 67 and 68, and GRO Order No. 4.

EDUCATION -- CONSERVATION

Montana Wildlife Federation

AFFILIATE OF NATIONAL WILDLIFE FEDERATION

410 Woodworth Ave.
Missoula, Montana
May 7, 1975



Mr. C. Rex Cleary
District Manager
Bureau of Land Management
P.O. Box 2020
Billings, Montana

Dear Rex:

Considering the potential for environmental impacts in geothermal developments, I would consider it essential to prepare an Environmental Impact Statement.

It is impossible for all of the concerned people to give proper consideration to alternatives without an inventory of land capabilities, projected impacts and duration.

If we were only talking about a permit to explore, an Environmental Analysis might be adequate, but it is my understanding that once the lease is granted there will be no impact review if the area is developed. Development closes too many options. The public must have an opportunity to participate in the decision.

Thank you for the opportunity to comment. Please keep me informed of this lease proposal and others as they develop.

Sincerely,

Donald Aldrich
Executive Secretary
Montana Wildlife Federation

cc: Thomas Kimball
Harry McNeal
Eldon Smith
Gay Easton
John Oberlitner
John Gilpatrick

THE WEALTH OF THE NATION IS IN ITS NATURAL RESOURCES
CONSERVATION DOES NOT END WITH CONVERSATION

RESPONSE TO DESCRIPTION
OF THE PROPOSED ACTION
HUNTERS HOT SPRINGS
GEOTHERMAL LEASE APPLICATION

Comments from: Donald Aldrich, Montana Wildlife Federation;
letter of May 7, 1975

In reply to an inquiry from Senator Lee Metcalf on behalf of Mr. Aldrich, the State Director answered questions raised by Mr. Aldrich in a letter to the Director, BLM, dated July 17, 1975.

Paragraph 3 refers to permits to explore and development. This analysis addresses the impacts not only of exploration, but also development, operation, and close-out.
See section I, B, and C; and section IV.

Paragraph 3 also refers to the need for public participation. This is addressed in sections X, and XI. In addition, the State Director's letter states in part,

> "In connection with the BLM's environmental assessment process, two points should be noted: First, the public is asked to participate, and in the geothermal assessment program particularly we are asking the involvement of agencies such as the Montana Department of Fish and Game and the U. S. Fish and Wildlife Service; and second, the environmental analysis is used as the basis for a determination whether or not an Environmental Impact Statement will be required, thus leaving open the possibility of even more extensive public review as necessary."

3200

United States Department of the Interior

OFFICE OF THE SOLICITOR
P.O. BOX 1538
BILLINGS, MONTANA 59103

RECEIVED
MAY 12 '75
B.L.M. Billings Dist.

May 9, 1975

Memorandum

To: District Manager, Billings District Office, BLM

From: Field Solicitor, Billings

Subject: Geothermal Lease Application - Hunter's Hot Springs Area

Thank you for your letter of April 29, 1975, regarding the above subject and providing this office opportunity to comment on the application discussion.

Please be advised we have reviewed the discussion and feel it to be a complete discussion of the resource and the application.

Richard K. Aldrich
For the Field Solicitor

RESPONSE TO DESCRIPTION
OF THE PROPOSED ACTION
HUNTERS HOT SPRINGS
GEOTHERMAL LEASE APPLICATION

Comments from: Richard K. Aldrich, For the Field Solicitor,
Department of Interior; letter of May 9, 1975

No discussion necessary.

Park Conservation District

1122 West Front Street - Livingston, Montana 59047 - Phone: (406) 222-2899

May 9, 1975

RECEIVED
MAY 1 [illegible]5
B.L.M. Billings Dist.

Mr. C. Rex Cleary
District Manager
Bureau of Land Management
Billings District Office
P. O. Box 2020
Billings, Montana 59103

Dear Mr. Cleary:

We reviewed your letter of April 29th concerning proposed geothermal exploration in the Springdale area at our last regular meeting.

We feel that geothermal resource should be investigated as a possible energy source. Our only concern is that good conservation measures be followed during the exploration. This would include disturbing the present vegetation as little as possible and possibly reseeding areas where the vegetation must be removed. We would also hope that any roads constructed would be of high enough standards that they won't cause erosion problems.

Sincerely,

Ray Keefer
By R.K.
Ray Keefer
Chairman

SUPERVISORS

RAY KEEFER CARL JOHNSON BRUCE MALCOLM JOHN RAGSDALE MARVIN SWANDAL

RESPONSE TO DESCRIPTION
OF THE PROPOSED ACTION
HUNTERS HOT SPRINGS
GEOTHERMAL LEASE APPLICATION

Comments from: Ray Keefer, Chairman, Park Conservation District; letter of May 9, 1975

Paragraph 2 is addressed to the concern for good conservation measures, specifically in revegetation and road construction. Reseeding and revegetation are discussed in section V, 2, page 63 and in GRO Order #4, and in the Geothermal Resources Lease (Appendix III and page 68-69).

Road construction is discussed in section II, C, 4, pages 10, 11, and 18; throughout the environmental impacts section; section V, 1, page 61, section V, 6, page 67; and GRO Order #4.

3200

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

P. O. Box 970, Bozeman, MT 59715

May 9, 1975

RECEIVED
MAY 12 '75
U.S. Billings Dist.

C. Rex Cleary
District Manager
Billings District Office
Bureau of Land Management
P. O. Box 2020
Billings, MT 59103

Dear Mr. Cleary:

Re: Application to lease federal geothermal resources for the purpose of exploration and possible geothermal development in the Hunter's Hot Springs Area

This is in response to your letter dated April 29 requesting comments on the subject lease application.

It is not possible for us to review the "Environmental Analysis" which is filed at your District Office within the allotted time.

Our comments should be on the effects of the project on the soil and water resources. The lease application is not intended to evaluate these effects. Present land use and natural resources and impacts of the project on the land and resources are not specifically discussed. Therefore, we feel that our comments on the geothermal lease application would not be appropriate.

We would appreciate the opportunity to review the "Environmental Analysis."

Sincerely,

C E Ogle

Van K Haderlie
State Conservationist

RESPONSE TO DESCRIPTION
OF THE PROPOSED ACTION
HUNTERS HOT SPRINGS
GEOTHERMAL LEASE APPLICATION

Comments from: Van K. Haderlie, State Conservationist, USDA:
letter of May 9, 1975

The effects on soil and water resources, and a discussion of present land use and resources in the Study Area is discussed at length throughout the analysis.

3200

May 12, 1975

RECEIVED
MAY 12 '75
B.L.M. Billings Dist.

C. Rex Cleary, Esq.
BLM District Manager
P.O. Box 2020
Billings, Montana 59103

Your reference #3200
Hunters Hot Springs Area
Montana

Dear Mr. Cleary:

This is in response to your communication of April 29, enclosing a discussion of Geothermal Energy. The open file copy of the draft of the Environmental Analysis report has also been reviewed, with the kind assistance of some of your staff. I do have comments, and appreciate being asked to contribute.

First of all, the geothermometry temperature fix at the top of page 23 says that "temperatures of only around 179°F might be expected at depth." As stated, this is misleading, as the Silica and Sodium-Potassium indicators give only a minimum figure. The geothermal waters are normally mixed with meteoric waters and no maximum potential is indicated. The "at depth" is different for 100, 1000, or 10,000 feet. Much higher temperatures are to be expected.

Seismic activity is discussed on page 19. One of the exploration tools is "passive seismic" where slight earth motion is monitored, without using any explosion of impact. The motion, or noise, is associated with fluid close to boiling point for the pressure at depth. It has almost no surface effect that would reach even 1 on the Richter Scale.

Regional seismic activity may not be directly associated with the geothermal area.

John R. Fanshawe 3116 East MacDonald Drive, Billings, Montana 59102

Another point, probably due to oversight, concerns "Airborne Exploration" on page 7. Under this heading, item 4 is gravity. There is no such thing as Airborne gravity. Perhaps the major heading might be Exploration with sub-headings reflecting the amount of ground surface disturbance as 1. None, 2. Minor, and 3. Some surface damage inevitable -- or some such wording.

In the main, you are to be complimented for a difficult task well done. The many facets have to be put into proper perspective and I think this summary will set good precedent for the future.

The resource being developed is not too well understood yet. It is an ideal energy source in terms of lack of polutants. The fuel is forever, new sources of ground water are usually added, to the usable supply, and it is profitable for both operator and landowner.

I am happy to see that the preliminary draft recommends that the leases be issued. Hunters is the most favorable area that I know of (in Montana) for testing. Success here would lead the way to more clean energy.

Sincerely,

John R. Fanshawe

Consulting Geologist
Mineral & Fossil Fuels,
and Geothermal Resources

CC: W.C. Kaufman

JRF:jw

John R. Fanshawe 3116 East MacDonald Drive, Billings, Montana 59102

RESPONSE TO DESCRIPTION
OF THE PROPOSED ACTION
HUNTERS HOT SPRINGS
GEOTHERMAL LEASE APPLICATION

Comments from: Dr. John R. Fanshawe, Consulting Geologist;
letter of May 12, 1975

Paragraph 2: See letter of H. C. Jim Taylor of May 13, 1975.

Paragraph 5 deals with "airborne gravity". This was removed.

MONTANA BUREAU OF MINES AND GEOLOGY
MONTANA COLLEGE OF MINERAL SCIENCE AND TECHNOLOGY
BUTTE, MONTANA 59701
(406) 792-8321

RECEIVED

May 12, 1975

Mr. C. Rex Cleary, District Manager
Bureau of Land Management
Billings District Office
P.O. Box 2020
Billings, Montana 59103

Dear Mr. Cleary:

The following comments are in response to your April 29 letter about the proposed leasing of federal minerals (geothermal resources) in the Hunter's Hot Springs area northeast of Livingston, Montana.

1. Does the applicant for the lease of federal geothermal resources have a market for the electrical power to be produced if an economic geothermal system is found in the area?

2. Exploration and drilling activity have little adverse effect on the land surface. Road construction should be held to a minimum, and the surface for those roads that are not required for the production phase of the project should be restored.

3. The removal of steam and hot water from the geothermal system (with and without reinjection of this water into the system) should be evaluated in terms of how it affects ground-water resources.

4. Construction of surface 10- to 30-inch water lines from the well to the power plant may preclude using the surface for agriculture. Any problems associated with underground construction should be investigated.

5. The nature of geothermal fluids in the Hunter's Hot Springs area (the mineral by-products and noxious and toxic gas and vapor content) should be determined in the exploration phase of the project, and feasible plans formulated to prevent these materials from contaminating the surface and atmosphere.

THE BUREAU OF MINES AND GEOLOGY WAS ESTABLISHED BY LAW IN 1919 AS A DEPARTMENT OF MONTANA COLLEGE OF MINERAL SCIENCE AND TECHNOLOGY, TO PROMOTE EFFICIENT DEVELOPMENT OF MONTANA'S MINERAL RESOURCES BY GATHERING AND PUBLISHING INFORMATION ON THE GEOLOGY, TOPOGRAPHY, AND MINERAL DEPOSITS OF THE STATE, INCLUDING METALS, NON-METALS, COAL, OIL, GAS, AND UNDERGROUND WATER SUPPLY

Using a geothermal system to generate electric energy to implement our future energy demand seems to be a worthy concept, as it would have little deleterious effect on surface resources, and it is recommended that the geothermal lease applications in the Hunter's Hot Springs area in sec. 20, 22, and 24, T. 1 S., R. 12 E., and sec. 4, Lots 1, 2, and 3, T. 1 S., R. 12 E., be approved.

Sincerely yours,

Willis M. Johns
Chief, Economic Geology Division

WMJ/ld

RESPONSE TO DESCRIPTION
OF THE PROPOSED ACTION
HUNTERS HOT SPRINGS
GEOTHERMAL LEASE APPLICATION

Comments from: Willis M. Johns, Montana Bureau of Mines and Geology; letter of May 12, 1975

Item 1 refers to market for electrical power. This is discussed in section II, C, 1, page 6; and further in section IX, A, page 74.

Item 2 refers to road construction and restoration. This is discussed in section II, C, 4, pages 10, 11, and 18; throughout the Environmental Impacts section; section V, 1, page 61, section V, 6, page 67; and GRO Order No. 4.

Item 3 refers to removal of hot water and steam in terms of effects on groundwater. The potential impact is discussed in section IV, F, page 48; and mitigating measures in section V, 2, page 61 as well as the GRO Orders.

Item 4 refers to underground pipelines. This is addressed in section II, page 12.

Item 5 refers to determination of toxic fluids during exploration and pollution prevention measures. Toxicity and water analysis is discussed in section III, A, 6, page 30, and in GRO Order No. 4. Pollution prevention measures are addressed throughout the analysis.

3200

RECEIVED
MAY 14 '75
B.L.M. Billings Dist.

United States Department of the Interior

GEOLOGICAL SURVEY
Conservation Division
P. O. Box 2550
Billings, Montana 59103

May 13, 1975

Memorandum

To: C. Rex Cleary, District Mgr., BLM, Billings, MT

From: H. C. Jim Taylor, Geologist, USGS, Billings

Subject: Your discussion of geothermal energy related to the Hunter's Hot Spring geothermal lease application. Your reference number: 3200

Your statement on page 23 of the "discussion" is misleading and should be corrected; that statement being, "Hunter's Hot Springs (USGS, 1975) 62.2 Mg/L indicates that temperatures of only around 179°F might be expected at depth".

Firstly, the stated temperature of 179°F at depth indicates a minimum temperature that would be expected. Your statement seems to imply that 179°F would be a maximum expected temperature. (1) Re-equilibration of the ionic species in solution as the water moves toward the surface and (2) the dilution of the hot water with cooler ground water are two possibilities which could affect the geochemical indicators used to establish the subsurface temperature of 179°F. This reported temperature may reflect either or both of these effects and thus should be considered a minimum temperature.

Secondly, your comment concerning 62.2 milligrams per liter evidently refers to the silica concentration in the water. It should be emphasized that the reported estimate of 179°F was not derived exclusively from the silica concentration, but was derived from estimates based upon the Na-K-Ca geochemical indicators plus the silica concentration of the water sample.

H C Jim Taylor

H. C. Jim Taylor
For the District Geologist

RESPONSE TO DESCRIPTION
OF THE PROPOSED ACTION
HUNTERS HOT SPRINGS
GEOTHERMAL LEASE APPLICATION

Comments from: H. C. Jim Taylor, USGS; letter of May 13, 1975

The letter is concerned about the misinterpretation of the USGS data concerning minimum expected temperature at depth. That error is now corrected to read, "Results of a geothermometry analysis of hot water at Hunters Hot Springs (GS, 1975) indicate that minimum temperatures of around 179°F might be expected at depth".
Section II, C, 6, page 20.

STATE OF MONTANA

DEPARTMENT OF FISH AND GAME

Helena, Montana 59601
June 16, 1975

Mr. C. Rex Cleary, District Manager
Bureau of Land Management
P.O. Box 2020
Billings, Montana 59103

B.L.M. Billings Dist.

Dear Rex:

As requested, we have reviewed the environmental impact statement relative to proposed geothermal leasing in the vicinity of Springdale, Montana. Our review has indicated there is a substantial potential for an adverse environmental impact to the fish and wildlife resource of that area.

In regard to the fishery resource, our greatest concern would be the specific measures to be taken to prevent damage to the Yellowstone River in the event of a blowout or other emergency. Since the Yellowstone is one of the finest trout fishing resources in this country, every conceivable precaution must be taken to prevent water quality degradation, either through the receipt of toxic substances or inadvertent warming of the river. These precautions must be not only to prevent damage from surface flows, but also from either contamination or alteration of the flow characteristics of groundwater as well.

As you know, Montana's water quality standards are good, and will ensure protection of our water quality if strictly enforced. We suggest that the lease applicant be made thoroughly aware of the standards and conditions he must live up to in regard to protecting the Yellowstone River.

In regard to the game resource, we feel the situation you describe - namely one plant per 640 acres surrounded by 30-32 wells with associated pipelines, roads and other attendant facilities - would be nearly a total loss to the big game population presently using the area. There is a large antelope herd estimated to be over 100 animals that winters on the private lands at Hunter Hot Springs. It would be very detrimental to game birds as well, especially if the actual structures are located on the major bird habitat.

What is needed at this time is an investment in a detailed inventory of the area so that the existing wildlife resource may be defined with more precision.

Concerning the actual BLM lands involved, we offer the following information that is presently available to us:

Sec. 20, T1S, R12E is occasionally used by a few deer and/or antelope; however, this particular section is not intensively used by wildlife.

Sec. 4, T2S, R12E is an excellent mule deer wildlife range. A local elk herd of approximately 30-40 animals may also use this land on occasion. There also may be some yearlong deer use.

Sec. 22, T1S, R12E also is a mule deer winter range with the probability of some yearlong use.

Sec. 24, T1S, R12E once again is a mule deer winter range and antelope also winter on the edges of these lands and on property adjacent to them.

You can see from this cursory examination that the area is valuable to the fish and wildlife resource. We strongly urge that you make the applicant aware of this and suggest to him that he prepare to mitigate and compensate for inevitable loss of this public resource.

Sincerely,

James A. Posewitz, Administrator
Environment and Information Division

JAP/sd

cc: Roger Fliger
Kerry Constan
Dennis Workman

RESPONSE TO DESCRIPTION
OF THE PROPOSED ACTION
HUNTERS HOT SPRINGS
GEOTHERMAL LEASE APPLICATION

Comments from: James A. Posewitz, State of Montana, Department of Fish and Game; letter of June 16, 1975

Paragraph 1 refers to review of the "environmental impact statement". No environmental impact statement (EIS) has been written. An environmental analysis record (EAR) is the document reviewed.

Paragraph 2 refers to concern for the fishery resource in the event of surface or groundwater pollution. Surface and groundwater pollution is discussed at length throughout the analysis. Section III, A, 8 and Appendix VI addresses the existing animal populations. The Environmental Impacts are discussed in section IV; and possible Mitigating or Enhancing Measures are addressed in section V, and Appendix III.

Paragraph 3 refers to the knowledge of the lease applicant of state water quality standards. The lessee is required to meet state or federal water quality standards (whichever is stricter), as stated in GRO Order No. 4.

Paragraph 4 addresses itself to the total impact upon the game resources assuming total geothermal development. We have addressed ourselves to this in the analysis, section IV, page 41; and in the Mitigating or Enhancing Measures, section V, page 61.

Paragraph 5 recommends future inventories inorder to define existing wildlife resources with more precision. This is a requirement of the state and federal agencies involved and is acknowledged as an ongoing procedure in GRO Order No. 4, section VI, Biota

Paragraph 11 refers to making the applicant aware of wildlife resource in the area. This office will provide a copy of this analysis to the lease applicant.

APPENDIX VI

APPENDIX VI

Wildlife Important to the Hunters Hot Springs Area
Park and Sweetgrass Counties
(Adapted from a More Complete Listing in the
Step 3, URA, Yellowstone Planning Unit)

Reptiles and Amphibians

Tiger salamander
Ambystoma tigrinum

Plains spadefoot
Scaphiopus bombifrons

Western toad
Bufo boreas

Woodhouse toad
Bufo woodhousei

Chorus frog
Pseudacris triseriata

Leopard frog
Rana pipiens

Painted turtle
Chrysemys picta

Snapping turtle
Chelydra serpentina

Sagebrush lizard
Sceloporus graciosus

Short-horned lizard
Phrynosoma douglassi

Gopher snake
Pituophis melanoleucus

Racer snake
Coluber constrictor

Milk snake
Lampropeltis triangulum

Common garter snake
Thamnophis sirtalis

Western terrestrial garter snake
Thamnophis elegans

Reptiles and Amphibians (contd)

Western rattlesnake
Cortalus viridis

Mammals

Shrews
Sorex sp.(s)

Bats
Myotis sp.(s)

White-tailed jack rabbit
Lepus townsendii

Snowshoe hare
Lepus americanus

Desert cottontail
Sylvilagus audubonii

Mountain cottontail
Sylvilagus nuttallii

Porcupine
Erethizon dorsatum

Beaver
Castor canadensis

Pocket mouse
Perognathus sp.(s)

Yellow-bellied marmot
Marmota flaviventris

Chipmunk
Eutamias sp.(s)

Black-tailed prairie dog
Cynomys ludovicianus

Ground squirrel
Cittelus sp.(s)

Mammals (contd)

Western jumping mouse
Zapus princeps

Brown rat
Rattus norvegicus

House mouse
Mus musculus

Bushy-tailed wood rat
Neotoma cinerea

Western harvest mouse
Reithrodontomys megalotis

Deer mouse
Peromyscus maniculatus

Muskrat
Ondatra zibethicus

Sagebrush vole
Lagurus curtatus

Voles
Microtus sp.(s)

Bobcat
Lynx rufus

Raccoon
Procyon lotor

Red fox
Vulpes vulpes

Coyote
Canis latrans

River otter
Lutra canadensis

Striped skunk
Mephitis mephitis

Badger
Taxidea taxus

Mink
Mustela vison

Mammals (contd)

Weasel
Mustela sp.(s)

Antelope
Antilocapra american

Elk
Cervus canadensis

White-tailed deer
Odocoileus virginianus

Mule deer
Odocoileus hemionus

Domestic cattle

Domestic sheep

Birds

Canada goose

White fronted goose

Snow goose

Mallard

Pintail

Gadwall

American widgeon

Blue-winged teal

Common goldeneye

Common merganser

Grebes

Vulture

Accpiter hawks

Marsh hawk

Buteo hawks

Birds (contd)

Golden eagle

Bald eagle

Prairie falcon

Peregrine falcon

Sparrow hawk

Sharp-tailed grouse

Sage grouse

Ring-necked pheasant

Great blue heron

Killdeer

Plovers

Sandpipers

Herring gull

California gull

Ring-billed gull

Mourning dove

Great horned owl

Long-eared owl

Short-eared owl

Common nighthawk

Belted Kingfisher

Common flicker

Hairy woodpecker

Downy woodpecker

Red-headed woodpecker

Birds (contd)

Kingbird - eastern

Say's Phoebe

Western wood pewee

Horned lark

Cliff swallow

Tree swallow

Black-billed magpie

Common crow

Black capped chickadee

Robin

Mountain bluebird

Shrike

Warbler sp.

House sparrow

Meadowlark

Red-winged blackbird

Brewer's blackbird

Sparrow sp.(s)

Fish

cutthroat trout
Salmo clarki

rainbow trout
Salmo gairdneri

brown trout
Salmo trutta

brook trout
Salvelinus frontinalis

Fish (contd)

mountain whitefish
Prosopium williamsoni

white suckers
Catostomus commersoni

lake chubs
Couesius plumbeus

mottled sculpin
Cottus bairdi

longnose suckers
Catostomus catostomus

mountain suckers
Catostomus platyrhynchus

longnose dace
Rhinichthys cataractae

carp
Cyprinus carpio

shorthead redhorse
Moxostoma macrolepidotum

burbot
Lota lota

APPENDIX VII

SUGGESTED PRACTICES FOR RAPTOR PROTECTION

ON POWERLINES

A report prepared in the public interest,

distributed by Raptor Research Foundation, Inc., for Edison Electric Institute

SUGGESTED PRACTICES FOR RAPTOR PROTECTION ON POWERLINES

In early 1972, a group of western utilities[1] with the assistance of the Edison Electric Institute, coordinated a workshop with various Federal and State agencies and other interested groups[2] to study the problems associated with raptor electrocution occurring on powerlines. It was determined that grounding practices on distribution and transmission lines from 4 kV through 69 kV along with certain configurations of transformer banks, fused cutouts, lightning arresters and conductor phase spacings could be a substantial cause of raptor deaths. Subsequent studies have proved that the solution to the problem lies more with engineering expertise than with a biological approach.

The electrocution problem appears to be greater in the western United States – primarily Colorado, Idaho, Nevada, Utah and Wyoming – because the eagle population is greater there. Recent studies also document electrocution losses of egrets, herons, crows, ravens, wild turkeys and other birds of prey, but current evidence shows that 90% of all electrocution victims are golden eagles. This loss of eagles is significant; but pesticide contaminations, loss of habitat, and illegal shooting remain the most threatening problems to raptors in general. The latter two mortality factors, which lead directly from land use patterns and irresponsible use of firearms, are of particular importance to eagle conservation.

The Department of the Interior has coordinated the counting of eagle electrocutions in the United States in cooperation with the electric utility industry and various State and private conservation agencies. Since initiation of this program, approximately 500 raptors, principally golden eagles, have been found at the base of power poles. A number of these deaths can be attributed to other causes including diseases, poisoning and irresponsible use of firearms. The count also showed 98% of the eagles electrocuted were young, inexperienced golden eagles that were just learning to fly. They had not yet attained the skill and precision necessary to negotiate a safe landing or take-off from a powerline pole supporting three or more conductors, transformer banks, fused cutouts or other equipment necessary to transmit or distribute electric energy.

To deal with the factors that contribute to raptor electrocutions, it is necessary to know some things about the birds: how they hunt, where they live and nest, and their art of flying. Eagles and hawks prefer to perch on elevated sites where prey species might be observed over a wide radius and where air currents are more favorable for flight. The preferred power pole perch, for instance, is more often one where the crossarm is perpendicular to the prevailing wind and commands considerable hunting territory. The use of powerline poles as perch sites varies according to topography, season and abundance of prey. Powerlines that traverse steep and broken terrain, where many natural perch sites are available, receive little use compared to those in flat, broad valleys where natural perch sites are absent. Most electrocutions take place during the wintering period when peak populations of eagles and hawks are present. At this time, resident birds, as well as migrants, tend to concentrate in mountain valleys, adjacent foothills and grasslands where food supplies are most abundant and available. During this period, powerline poles receive heavy use as perches, as evidenced by droppings on crossarms and castings beneath the poles. Losses may be expected if lines in these areas are not properly designed or modified.

Through the efforts of many, including Dr. Richard R. Olendorff, Bureau of Land Management (BLM), Washington, D. C., Mr. Erwin L. Boeker, U. S. Fish & Wildlife Service, Denver, Colorado, and Mr. Morlan W. Nelson, recognized authority on birds of prey and Birds-of-Prey Consultant to the Idaho Power Company, more has become known about the eagle's habits and habitats. This information has been used by the electric utility industry to pinpoint and then minimize or eliminate the problem through design changes on certain portions of existing, as well as future, lines.

On March 27, 1972, the Rural Electrification Administration (REA) issued Bulletin 61-10 which was titled "Protection of Bald and Golden Eagles from Powerlines". This bulletin dealt with the causes of raptor electrocutions from certain grounding practices that made it difficult for large birds of prey to fly away from or roost on powerline poles or appurtenances without simultaneously contacting an energized conductor and a ground, thereby causing a completed circuit and electrocution. With this bulletin, the REA specified that all cooperatives would change grounding and construction practices to eliminate the possibility of electrocution. Some of the suggested designs, alterations and additions of special perches can be seen in Exhibits 1 through 4 in the Appendix. Suggestions for increasing phase spacings on pre-1962 standard construction were included. Exhibit No. 2 shows that pole ground wires could be gapped and still provide lightning protection to the powerline. This procedure eliminates a positive ground during normal operation of the line, thus minimizing the possibility of simultaneous contact between an energized conductor and ground. It was not intended that all existing lines be altered, but it was implied that preferred poles would be modified when multiple electrocutions at specific locations could be documented and proved.

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1 *Idaho Power Company, Pacific Gas & Electric Company, Pacific Power & Light Company, Public Service Company of Colorado, Tucson Gas & Electric, Utah Power & Light Company.*

2 *Colorado Division of Wildlife, National Audubon Society, National Wildlife Federation, Rural Electrification Administration, U. S. Fish and Wildlife Service.*

Concurrent with the action by the REA, certain western investor-owned utilities, such as Idaho Power Company, Utah Power & Light Company, and Pacific Power and Light Company, began detailed research into possible solutions to the problem. Following documentation of raptor electrocutions, these utilities, along with Nevada Power Company and California-Pacific Utilities Company, began formulating procedures and developing designs and methods for modifications and additions to both existing facilities and new construction which would eliminate raptor electrocutions on their powerline structures. The Idaho Power Company engaged the services of Morlan W. Nelson who flew his trained eagles through and perched them on unenergized structures of typical designs and configurations while taking slow motion movies to determine and document whether or not the eagle would actually come in contact with conductors at various spacings and locations on the poles. This research project also established what type perches were acceptable to the eagle and that they do not perch on the smooth, slick surface of an insulator.

The results of all efforts by the electric utility industry have significantly reduced the raptor electrocutions and have resulted in a number of suggested solutions to the problem. These suggested practices could be used by the electric utility industry and land management agencies to assure proper design and precautions in raptor-inhabited areas. Some of the suggested practices are as follows:

1. *If possible, adopt armless construction or variations of same on new distribution or subtransmission lines. Due to the physical separation and orientation of the conductors, and lack of suitable perches, this type construction will not present an electrocution hazard to raptors (see Exhibits 11 through 14).*

2. *Safe crossarm type construction has been designed by lowering the arm which supports the two outside conductors and installing the center conductor on a pole top pin. The vertical separation required is a function of the crossarm length. An eight-foot crossarm should be lowered a minimum of 38 inches below the pole top which results in an effective vertical phase-to-phase dimension of 43 inches because of insulator dimensions and pin attachment positions. An eleven-foot crossarm can be placed a minimum of 30 inches below the pole top (see Exhibits 1, 6, 7 and 16).*

3. *On existing crossarm construction, a pole top extension may be added to the pole such that the top conductor phase is approximately 43 inches above the pole top when used with an 8'–0" crossarm (see Exhibit 5, note exception).*

4. *A wood perch, made of 2" x 4" material, can be adequately mounted and oriented several feet above any energized object. It must be properly designed to withstand the landing and take-off forces of large birds (see Exhibit 4). (Idaho Power Company can supply specific designs.)*

5. *An insulated conductor cover and insulator hood, extending approximately six feet on either side of the insulator, may sometimes be used as a practical solution of modifying existing structures (see Exhibit 3).*

6. *Use wood braces for stabilizing crossarms. Either gap groundwires to prevent solidly grounding braces and hardware or stop the groundwire approximately 48 inches below the crossarm position (see Exhibits 1, 5, 6, and 7).*

7. *Where transformer banks and protective equipment are necessary, install all equipment and protective devices on a lower crossarm, which leaves the top crossarm for perching. Use covered jumpers connecting primary transformer bushings. Use bird guards on transformer bushings where possible (see Exhibit 9).*

8. *Add insulating extension links to primary deadends, which effectively increases phase-to-phase separation and allows safe perching at the pole top or on the crossarm (see Exhibit 8).*

9. *Use wood or non-conductive braces on top crossarms when crossarm construction is necessary.*

10. *When grounding is absolutely essential, use of mouldings (wood, plastic, etc.) in critical areas can be employed.*

The foregoing suggested practices along with the other exhibits included in the Appendix have been effective in reducing electrocution losses and are being used by the electric utility industry. The constantly changing technology of the electric utility industry, along with the inconsistent requirements and locations of new electric loads, does not allow specific designs or dimensions to be dictated for all systems and situations. The design engineer has certain basics with which to work, but is dependent upon Federal, State and Local land management or wildlife conservation agencies to recognize those areas that are not critical, potentially critical, or extremely critical. The land manager must in turn depend upon the design engineer to design the line to protect the raptors as each situation dictates. Since it is not economically feasible to modify all existing lines, and not necessary to have all new lines designed to protect raptors where they do not occur, land managers and engineers must blend their technology and expertise to serve the public effectively with needed energy in the most efficient, most economical way, while simultaneously protecting the environment and its inhabitants. Permit-issuing agencies and the electric utility industry are governed by the following legislation as it relates to the problem of raptor electrocutions:

1. *Bald Eagle Protection Act of 1940 (16 U.S.C. 688 et seq.) as amended.*

2. *Endangered Species Act of 1973 (87 Stat. 1064).*

3. *Migratory Bird Treaty Act of 1918 (16 U.S.C. 703 et seq.) as amended.*

Wording of the permits issued for the construction of powerlines across public lands should allow the design engineer the latitude which he needs to design a reliable, economic line to serve the load, and yet protect the raptor population within the limitations of the above-listed Acts. The following suggested statement should help clarify, for all agencies and utilities concerned, what would be necessary and sufficient to assure permit-issuing agencies that raptors have been considered during the design phase of the line.

> *"The applicant, grantee or licensee shall be governed by 'Suggested Practices for Raptor Protection on Powerlines'. Use of this information should be made to design the proposed (name or description of line) kV powerline for designated raptor areas with proper grounding, phase spacing and configuration such that it will prevent, to the best of the design engineer's ability, the electrocution of raptors. The applicant shall provide for the grantor, or licensor, drawings which show phase spacings, configurations and grounding practices of the proposed line, and these shall be made a part of the permit.*
>
> *The use of designs other than those included herein that are, in the opinion of a raptor expert, raptor safe, shall be permitted on public land rights-of-way. The costs for review of such alternate designs shall be at the applicant's expense.*
>
> *The grantor, or licensor, in issuing this permit, hereby assumes its responsibility to inform the applicant, grantee, or licensee of those areas which are designated habitats or potential habitats of raptors or other birds of prey. Any available biological or land management information in meeting the above-stated goal shall be made available to the engineer."*

Additional copies can be obtained from:

Raptor Research Foundation, Inc.
Department of Zoology – 167 WIBD
Brigham Young University
Provo, Utah 84601

Bureau of Land Management
Library
Denver Service Center

Form 1279–3
(June 1984)

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